Pacific Discovery

ALICE EASTWOOD

PUBLISHED BI-MONTHLY BY THE CALIFORNIA ACADEMY OF SCIENCES

IN THIS ISSUE: *A. Starker Leopold*
LeRoy Abrams • Borys Malkin • Peyton Moncure
Ira L. Wiggins

VOLUME II • NUMBER 1
January-February 1949
FIFTY CENTS

A JOURNAL OF NATURE AND MAN IN THE PACIFIC WORLD

THE CALIFORNIA ACADEMY OF SCIENCES

SAN FRANCISCO

BOARD OF TRUSTEES

J. W. Mailliard, Jr. . . . . *President* Charles Page . . . . . *Vice-President*
Miss Louise A. Boyd • Bruce Cornwall • Edward E. Hills • Daniel E. Koshland
Norman B. Livermore • T. S. Petersen • Mrs. Henry Potter Russell
Brayton Wilbur
The President of the Academy, Ex Officio • *The Treasurer of the Academy, Ex Officio*
J. F. Landis
Secretary to the Board

OFFICERS OF THE ACADEMY

M. E. Lombardi . . . . . *President* W. I. Follett . . . *Recording Secretary*
E. B. Babcock . . . *First Vice-President* Francis P. Farquhar . . . . *Treasurer*
George S. Myers . *Second Vice-President* Charles H. Danforth . . . *Librarian*
E. O. Essig . . *Corresponding Secretary* Robert C. Miller . . . . . *Director*
The officers named above constitute the COUNCIL of the Academy

SCIENTIFIC STAFF

Robert C. Miller, Ph.D., *Director*

Robert P. Dempster, M.S. *Aquatic Biologist*
Alice Eastwood . . . *Emeritus Curator of Botany*
W. I. Follett . . *Curator of Ichthyology*
G. Dallas Hanna, Ph.D. . . *Curator of Paleontology*
Velma Harris . . *Assistant Preparator of Exhibits*
Earl S. Herald, Ph.D. . . . *Curator of Aquatic Biology*
Leo G. Hertlein, Ph.D. . . . . *Assistant Curator of Paleontology*
John Thomas Howell, M.A. . . *Curator of Botany*
Edward L. Kessel, Ph.D. . . . *Research Assistant in Entomology*
Hugh B. Leech, M.S. . *Assistant Curator of Entomology*
Elizabeth McClintock, M.A. . . *Assistant Curator of Botany*
Robert T. Orr, Ph.D. . . . *Curator of Ornithology and Mammalogy*
Mary L. Perry, B.A. . .*Research Assistant in Mammalogy*
William B. Pitts . . *Honorary Curator of Gem Minerals*
Edward S. Ross, Ph.D. . . . *Curator of Entomology*
Veronica J. Sexton . *Executive Librarian*
Joseph R. Slevin . *Curator of Herpetology*
W. Barclay Stephens, M.D. . *Honorary Curator of Horology*
Cecil Tose . . . *Preparator of Exhibits*
Edwin C. Van Dyke, M.D. . . *Emeritus Curator of Entomology*
M. Vonsen . . . *Honorary Curator of Mineralogy*
M. Woodbridge Williams. B.A. . *Junior Aquatic Biologist*

RESEARCH ASSOCIATES

Mr. C. C. Church • Professor E. O. Essig • Professor G. F. Ferris
Dr. J. Linsley Gressitt • The Reverend Edward S. Guedet • Dr. Thomas H. Kearney
Dr. Earle G. Linsley • Dr. E. Gorton Linsley • Mr. Anatole S. Loukashkin
Mr. Borys Malkin • Mr. Lewis S. Rose • Mr. Lawrence W. Saylor
Mr. Allyn G. Smith • Mr. A. M. Strong • Dr. R. L. Usinger

Founded in 1853

VOLUME II • NUMBER I **Pacific Discovery** JANUARY-FEBRUARY 1949

Editor and Art Director: DON GREAME KELLEY • *Managing Editor:* ROBERT C. MILLER
Associate Editors: WILBERT M. CHAPMAN *(University of Washington)*
JOHN L. KASK *(Food and Agriculture Organization, UN)* • A. STARKER LEOPOLD *(University of California)*
ROBERT T. ORR *(California Academy of Sciences)* • EDWARD S. ROSS *(California Academy of Sciences)*
IRA L. WIGGINS *(Stanford University)*

In This Issue

Alice Eastwood.
Photograph by FRANK L. ROGERS . . . Cover
EDITORIAL: *The Integrity of the Chinese* . . 2
Adios, Gavilán. A. STARKER LEOPOLD 4
Alice Eastwood—Western Botanist.
LEROY ABRAMS 14
ROADS TO DISCOVERY:
Saharan Contrasts. BORYS MALKIN . . . 18
White Bison. PEYTON MONCURE 26
Huigra's Medico. IRA L. WIGGINS 27
FROM THE READER 29
REVIEWS 30

Pre-Discovery

While readers of *PD's* first issue (January-February 1948) were enjoying William Beebe's "Hummingbirds of the Mist," its author, at Rancho Grande for another season, was beginning the four months of daily observations through his binoculars that revealed the "Private Lives of Jungle Falcons"—made public for the first time in our March-April 1949 issue. Dr. Beebe writes that his Venezuela book, *High Jungle* (Duell, Sloan and Pearce), is at last near publication. "Private Lives" will be a preview.

With a quick change of the catch line to "Post-Discovery," we have a postscript to our November-December editorial on the late Sir D'Arcy Wentworth Thompson, distinguished Scottish biologist. This was told to Dr. R. C. Miller by Mrs. Albert Henry Hill of Berkeley, who graduated from St. Andrews University in 1943. One day in the winter of 1941 Mrs. Hill found Sir D'Arcy leaving his laboratory and drawing about his broad shoulders the flowing cape that was a familiar part of his outdoor accoutrement. "Do you know where I got this cape?" the Great Man addressed her. "Look at it—feel it. You can't get material like that these days. My father gave me this cape when I went to Cambridge as an undergraduate in 1879!"

Looking both ways for a moment, we have maps on our mind. We'd planned to run a places-and-routes map with each "Roads to Discovery" article; but, every time, the question comes up: Map or more pictures? It was opined that most readers have atlases, or access to them, whereas a given story's illustrations could be found only in *PD*. That doesn't settle it, however; reader preference would —if we knew it.

Discovering PD's Authors

A. Starker Leopold, Assistant Professor of Zoölogy and Conservationist in the University of California, is already known in *PD* as hard-hitting editorialist on basic conservation issues. When last summer he retraced old trails in the wilderness headwaters of Río Gavilán, high in the Sierra Madre Occidental of western Chihuahua, to find loggers and cattle stamping out the haunts of deer, wild turkey, quail, and mountain lion, and the source of clear waters—Dr. Leopold knew the story he would write was to be "Adios, Gavilán."

Emeritus Professor of Botany in Stanford University, **LeRoy Abrams** is one of the many for whom the name of "Alice Eastwood—Western Botanist" has significance far deeper than that implied when the venerable Curator of the Academy's herbarium is called America's foremost woman botanist. Dr. Abrams belonged to the first generation of students to come under the warm personal regard of her who has been, during more than fifty years, teacher, philosopher, and faithful friend to a host of fellow-botanists, amateur and professional alike. Chief of Dr. Abrams' many published works is his *Illustrated Flora of the Pacific States.*

That one-man C.A.S. entomological expedition, Research Associate **Borys Malkin,** has cleared the entanglements of French Colonial red tape which hampered his crossing of the western Sahara, and established an advance base on the Gulf of Guinea. His copy as "foreign correspondent" for *PD* comes in the shape of letters to his old friend the Editor, and is authentically so published under "Roads to Discovery."

Writing from Missoula, **Peyton Moncure** ("White Bison") says he is "a free lance writer-photographer . . . Former staff photographer for both Yellowstone National Park and the U. S. Forest Service . . . An amateur naturalist-microscopist" who spends every spare moment in summer "'marsh-combing' in swimming trunks, with canoe, color camera, collecting jars, and notebook, along western Montana's wildlife refuge lakes and marshes."

Our Associate Editor, Dr. **Ira L. Wiggins,** who recollects "Huigra's Medico," is Professor of Botany in Stanford University. Formerly Curator of the Dudley Herbarium, he is now Director of the University's Natural History Museum. He is specially interested in the flora of the Sonoran Desert and Baja California.

Pacific Discovery is published bi-monthly at the Gillick Press by the California Academy of Sciences. Publication office: 2057 Center Street, Berkeley 4, California. Editorial and Advertising offices: Golden Gate Park, San Francisco 18, California. Subscriptions: $3 per year. Single copies: 50c. Members of the Academy subscribe through their dues. Entered as second-class matter February 17, 1948 at the post office at Berkeley 4, California, under the act of August 24, 1912.

Copyright 1949, by the California Academy of Sciences.

The Integrity of the Chinese

THIS IS NOT AN EDITORIAL on American foreign policy as it relates to China—on that the most eloquent comment is an embarrassed silence. This is an editorial on the Chinese character.

Anyone reading even a fraction of the reports coming out of China will find in them a bewildering array of contradictory statements. Our vacillating, uncertain, aimless policy toward China indeed derives from this; it is an expression of a kind of national schizophrenia growing out of our inability to reconcile these contradictions.

On the one hand we are told that the Chinese are friendly, reliable, hard-working people, with a high sense of honor, and with a cultural heritage and philosophy of living from which the western world has much to learn. "No finer people ever lived," the Old China Hand will assert. On the other hand, with equal vehemence, one correspondent after another, reporting particularly on American aid to China, has given us a completely different story—a story of wastefulness, inefficiency, graft, and greed. Nationalist China, we are told, is permeated from top to bottom with bribery and corruption, and American supplies wind up sooner or later in the black market.

Strangely enough, of these two conflicting versions of the Chinese situation, both contain a considerable measure of truth, and—more remarkable still—when properly understood they cease to be conflicting. It is correct that, according to American standards, the Chinese are inefficient, but no more so than any agricultural people pushed rapidly into a machine civilization—no more than, for example, the Russians. In fact, it is worthy of remark that almost identical allegations have been made of Russian inefficiency and waste in the use of American lend-lease supplies.

As regards other characteristics that have been mentioned, two things need to be said. One is that the Chinese, along with everybody else, are entitled to their fair share of the virtues and the vices of the human race; some are friendly and some unfriendly, some are disciplined and some profligate, some are honorable and some base; they will average up at least as well as the rest of us. The other thing to be said is that, with the characteristic if unconscious arrogance that foreign peoples find pretty exasperating, we assume that what is right for America must necessarily be right for the rest of the world. If instead of judging the Chinese by American standards we would judge them by their own, the inconsistencies we find so disturbing would disappear.

The moral code of western nations involves absolute concepts of right and wrong, of goodness and wickedness, of justice and injustice, derived in general from a synthesis of Old and New Testament teachings and Roman law. Various efforts have been made to place our moral code on a pragmatic basis; but it is likely that two-thirds of the people living in the western world today regard the moral law as the law of God, to be violated only at the risk of certain penalties, the most immediate of which is an uneasy conscience. "Fear God, and keep his commandments: for this is the whole duty of man."

The Chinese have no fear of God; they are much more likely to worry about incurring the wrath of some particular local devil—the dragon that dwells in the lake or in the interior of yonder hill. While the Chinese through their long history have had many moral and ethical teachers, the moral code that has gained widest acceptance is that of Confucius, which can best be defined as a system of social ethics. Under this system there are no moral absolutes backed by supernatural authority; conduct is good or bad according to the way it relates to the community. Good behavior is wise behavior, which gains the respect of your fellows; bad behavior is unwise behavior, which gets you into various kinds of trouble. Confucius emphasized wisdom, propriety, sincerity, filial devotion and, remarkably enough, good government! Basically Confucianism is the sort of thing that might come out of a conference involving Benjamin Franklin, John Dewey, and Emily Post.

Notwithstanding its expression in many of our familiar maxims (Honesty is the best policy, Politeness pays, Be good and you'll be happy, etc.), this idea of moral behavior based on practical, earthy considerations is startling to the western mind. It explains much of our difficulty in understanding the Chinese. It leads to patterns of conduct that seem topsy-turvy to us, but it is well to remember that a good deal of our conduct seems topsy-turvy to them.

Let us take, for example, such matters as banditry and piracy. In America there are probably a dozen or more hold-ups going on this very minute, but the people committing them are supposed to know that their conduct is both illegal and wicked. If we catch them we put them in jail for the protection of society and because they have violated the laws of God and man. Piracy is even worse—it violates admiralty law.

In China banditry and piracy are likewise frowned upon, and perpetrators are liable to severe punishment when caught. However, there is no particular moral stigma attached. Banditry is looked on somewhat as we regard driving a car

in excess of the speed limit—it's a crime but not a sin. Piracy is just another way of making a living, hazardous, it is true, and not conducive to longevity—something like being a steeple-jack or an airplane test pilot. Such pursuits may hasten your arrival in the next world but they do not impair your standing after you get there.

A few years back the city of Kong-Moon was harassed by roving gangs of bandits. The city fathers, after due deliberation, hired the most important and influential of the bandit chiefs in the neighborhood to protect them from the others. He accepted the assignment in good faith, and became the local equivalent of a county sheriff.

I once visited a Confucian temple of which the custodian—a venerable, genial old soul—was reputed to be a retired bandit. The story was that he had followed his earlier calling until he had reached the margin of diminishing returns—until, in fact, he was in danger of being liquidated—whereupon he withdrew from the world and took up a life of virtue and meditation. If this account be true, and I have no reason to doubt it, I would venture the opinion that the old bandit-become-saint never entertained a thought of repentance or expiation, and probably did not even regret his earlier misdeeds. The Chinese simply have no sense of sin, a deficiency Americans are likely to envy and at the same time to deplore.

There is a good deal of counterfeiting in China, rather more than in America—although at the moment of this writing I have on my desk a warning from the U. S. Treasury Department to watch out for counterfeit ten dollar bills. Most business in China is or used to be transacted in silver; and when you cash a check at a Chinese bank, you never think of leaving until you have examined every coin and rung it on the counter or on the floor. Any coin you don't like you turn back and the cashier will cheerfully give you another. Counterfeit money which is reasonably convincing may even be accepted by the banks at a suitable discount.

Once I showed a doubtful dollar to a Chinese friend and asked him, "Is this money good or bad?" He examined it carefully, jingled it on the table a few times, and then returned it to me with the comment, "Fair!" The idea that money can be good, bad, or middling, does not come easy to Americans—but it grows easier day by day as we watch the value of our dollars decline.

To accuse the Chinese of "black market" activities is simply meaningless. Every market in China is black, and always has been. The price of any commodity is whatever the seller will accept for it, or more properly, whatever the buyer can be induced to pay. Moreover, everyone who takes part in a transaction expects to be cut in on the profits. The cost of groceries to the ultimate consumer will include a commission to everybody from the wholesale merchant down to the consumer's cook. There is nothing dishonest about this—it is just the Chinese way.

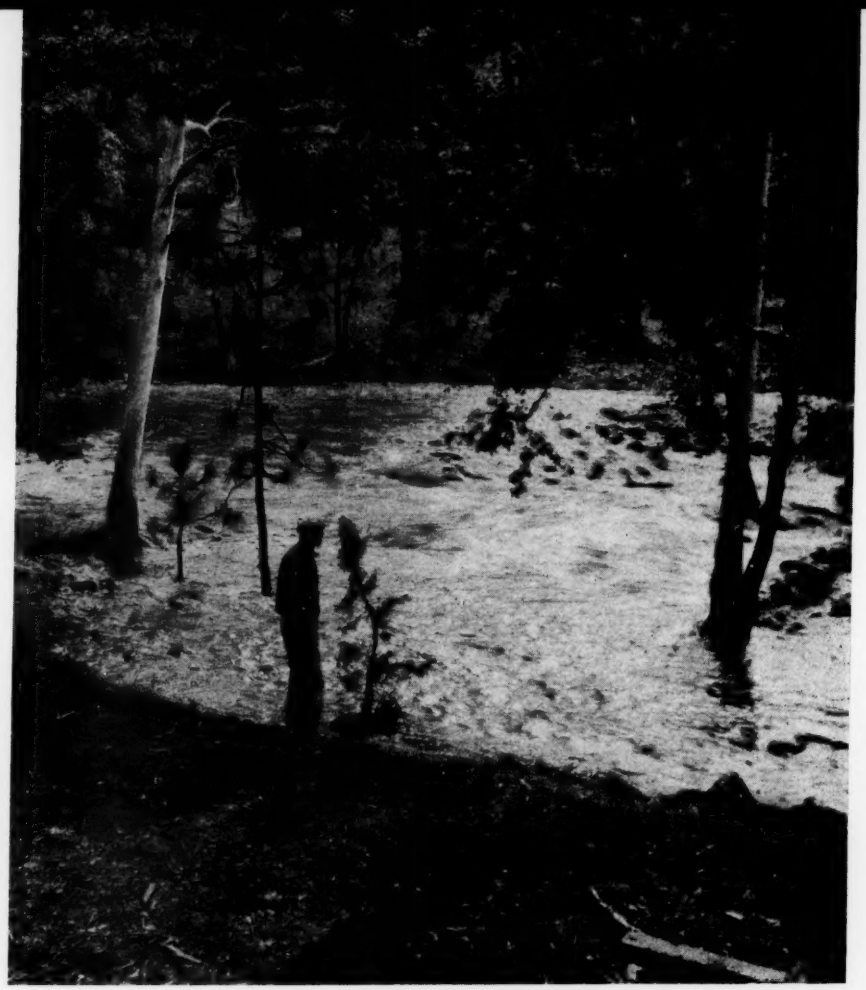
When it comes to bribery and corruption in government, we find the Chinese and ourselves much more nearly on common ground. We share the same confusion between statesmanship and politics and the same discrepancies between principles and practice.

There are certain differences in point of view. In America it is right to tip a waiter or a porter, but wrong to tip a policeman or a judge. In China there are no such fine distinctions. If, by a suitable tip to a magistrate, you can get your uncle Wah Lee out of jail, this seems to the Chinese mind a direct and forthright way to achieve a desirable end. It might not be easy to explain to a Chinese why he should abandon this time-honored procedure in favor of a larger expenditure for attorneys, bailbond brokers, and writs of habeas corpus.

A number of people who ought to know better have represented the Chinese Communists as an army of reform, fed up with the venality of the Nationalists and moving forward in righteous wrath to throw the rascals out. Any Old China Hand will tell you there is something wrong with this picture. You don't change the traditions of a people by changing their party or their government. As the French put it, "*Le plus la différence, le plus c'est la même chose.*"

Let not the pot call the kettle black. We have had our share of public scandals at every level of government. Once we even elected a president of the United States through open and brazen corruption of the electoral college. When these things happen here, we get embarrassed and forget them as quickly as possible. When they happen in China we cite them as examples of Oriental skulduggery. Why not be as kind to the Chinese as we are to ourselves? If they are going to be saved, it will be in their way, not ours. After all, Chinese culture was already old before the Anglo-Saxons learned to read and write.

Loyalty to family, loyalty to friends, respect for the aged, graciousness in social relations, and faithful adherence to one's pledged word—these are the particular virtues the centuries have taught an ancient and wise race. Those westerners who have known the Chinese longest and best are the greatest admirers of the Chinese character. It would be interesting to know whether the Chinese can say as much for us. R. C. M.



In the wilderness days before lumbering and grazing, floods like this were unknown to the Río Gavilán. (Photograph by the author)

Adíos, Gavílán

A. STARKER LEOPOLD

WHEN FIRST I KNEW THE Río Gavilán it was a tumbling mountain stream whose stable channel showed no gravel beds and whose trout knew not the choking silt of floodwater. From the virgin pinelands of the Sierra Madre a thousand crystal springs fed its current. If freshets followed the summer rains, they left no scars. Presumably lightning cracked along the rims as it does now, and thundershowers drenched the hills each summer afternoon. But the ungrazed mat of grama grass held back both soil and water, and from this sponge the springs were fed throughout the year. For in 1937 the watershed of the Gavilán was a wilderness, unmarred by ax or cow. Like a few other mountain regions of Mexico, it had been spared for a later generation to exploit. The river knew well the flashing draft of lightning fires in the grass but not the consuming roar of a slash fire. Each dusk brought out the deer to nibble ceanothus along its banks, but the cows had yet to munch its golden grama. It had heard the light ax of the passing hunter bite the limbs of dead junipers but not the crash of falling pines.

My father took me there to hunt deer, and although I was too young perhaps to appreciate fully the "symphony of the wilderness" as he called it,* I still was conscious of an untrammeled beauty in the country. From the village of Casas Grandes, Chihuahua, we had come by truck over a tenuous and even dangerous road to the hamlet of Pacheco, well up the east slope of the Sierra Madre. From there we crossed the continental divide by pack train and dropped down to the Río Gavilán on the west slope, leaving the last traces of civilization on the east side. In a month of hunting we killed enough deer and turkeys to keep the Dutch oven

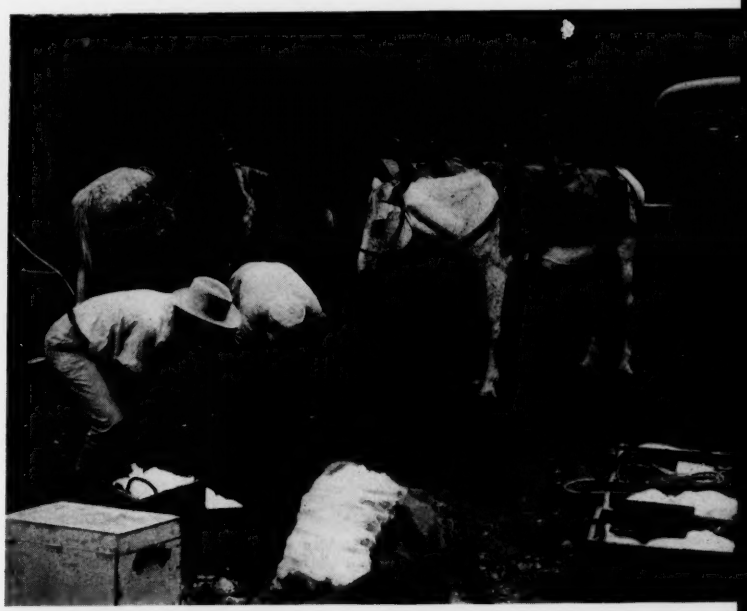
* "Song of the Gavilán" by Aldo Leopold (*Journal of Wildlife Management*, 4: 329-332, 1940).

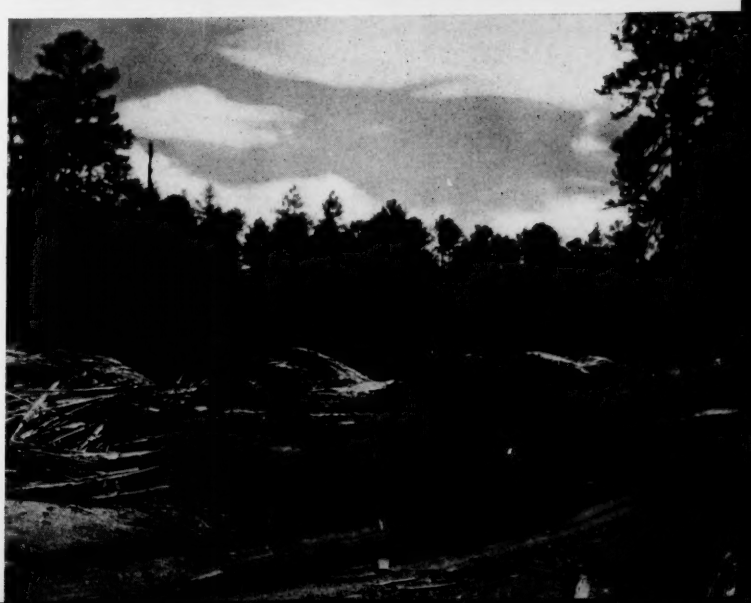
filled, and we reveled as always in our escape from schools, telephones, bank accounts, and the other trivia of everyday existence. We had, of course, escaped before to countless other camps; but there was a "flavor" about the Gavilán that I for one had not known elsewhere. This was *wilderness,* as distinct from the *back forty.* Each saddle in a pine ridge or pass through the rimrock was in my boyish imagination a new route to be explored for the first time by a white man. I even wondered if a few of Geronimo's Apaches might remain in some hidden barranca—a thought that made my scalp tingle one early morning when a mysterious column of smoke rose from the canyon below me and then was snuffed out as suddenly as it had appeared. It developed later that our packer had set fire to a "witch's broom" in a low pine bough, but that feeling of wild elementalism I shall not soon forget. Such adventures of the mind can occur only in the proper setting.

The wilderness of the Gavilán lived on in memory and fireside yarn, and a decade passed before the opportunity came for a second visit. Then in the summer of 1948 I returned to help make a collection of the vertebrate animals of the region for the Museum of Vertebrate Zoölogy, of the University of California. My companions were Alden Miller and Ward Russell of the Museum, and Robert McCabe of the University of Wisconsin. In addition to collecting specimens we hoped to initiate some long-term studies of the native fauna under virgin conditions. Of particular interest would be an investigation of the balance between deer and their natural predators — wolves and mountain lions. Such a problem could not be solved in one summer, and I hopefully visualized years of intermittent work in the Gavilán basin.

Early in July we crossed the border at Antelope Wells, New Mexico—a cluster of ranch buildings set in the middle of a great plain. The corresponding group of shacks across the international boundary is called Berrendo, which of course means Antelope. It was gratifying to learn that there still are several bands of antelope on this plain. In our high-wheeled truck we negotiated the hundred miles of sandy track to Casas Grandes, and after stocking up with last minute provisions we turned west toward the mountains and Pacheco.

At once it was evident that a great change had come to the Sierra Madre. The narrow, rocky road of eleven years back was graded and ditched, and around almost every bend we met a lumber truck groaning down the grade under a staggering load of pine planks. From one of the drivers we learned that the lumber was transferred to railroad cars in Casas Grandes for shipment to the hungry markets of the United States. American "progress" had arrived with a vengeance. One of the mills was at Pacheco; a dozen others were operating in the high country around García and Chuhuichupa — the headwaters of our Gavilán. Up to this time, however, the loggers had not reached the particular area where we hoped to camp, but they were working in that direction from three sides. We knew then that instead of initiating an era of renewed acquaintance with the wilderness, we had come to witness its passing. Elsewhere in Mexico I had learned that sawmills and logging roads are followed inevitably by settlers and livestock. Once logged, a wilderness becomes merely a forest and





ABOVE: *We packed into the Gavilán from Pacheco with seven animals. Floyd Johnson, our packer and guide, brought in additional supplies as needed, taking a load of specimens back to Pacheco on each trip.*

BELOW: *Debris left by a transient lumber mill near García in the headwaters of the Gavilán. (Photographs by Robert McCabe)*

it may not remain a forest for long, so great is the "land hunger" of agricultural Mexico.

Our pack train unloaded on the bank of the Gavilán exactly where we had camped a decade earlier. Tall pines still stood on the narrow bottomland, and Mexican jays streamed through the lower branches as noisily as ever. The river bluffs were studded with crusty old junipers and oaks just as I remembered them. But the river itself was not the same. What had been a narrow channel winding between grassy banks was now a wide, scoured trough of cobblestones left by summer floods. The banks were undercut and piles of debris marked the high water levels of recent years. Sand bars in sheltered coves of the channel were mixed with coarse pine sawdust from the mills upstream. Apparently the logging in the headwaters, followed by hot slash fires, had destroyed in part the "watershed sponge," and the Gavilán was experiencing flash floods—the inevitable result of watershed abuse. We came to know these floods too well during the summer. It was fortunate indeed that we happened to select a knoll for our camp. Even there we came near being drowned out on one or two occasions.

In addition to the loggers, there had been another invasion that contributed to erosion and runoff: livestock had arrived. In 1937 there was no stock in the Gavilán basin, but in 1948 we found hundreds of cattle and nearly as many horses. Recently, some large bands of sheep had summered in the area. A tumbled down herders' shelter stood a hundred yards from our tent. The original bunch-grass sod (largely *Bouteloua hirsuta*) of the river bottomlands and of the more accessible mesas already had been slicked off by concentrated grazing, and in its place grew spindly annual weeds, some native but many of Mediterranean origin.

Such were the changes that were overtaking the Gavilán. We found, happily, that many of the steep side-canyons had been little altered, and by selecting our hunting grounds we could spend our days in pockets of untouched wilderness. Only the whine of distant sawmills and intermittent road blasting, audible on still mornings, kept reminding us that this was to be the last summer of solitude. For the moment we still could see something of the natural balance in the native vertebrate populations. After a few days of exploratory hunting we settled down to study the wildlife as it had existed here for past eons, at the same time levying our tribute upon the land—specimens for our collections. It is my object here to recount something of what we learned on our daily morning hunts.

The Gavilán basin is a broken country of rocks and canyons. The area encompassed in this photograph was the favored range of several mountain lions. (Photograph by the author)

LEFT: *Some of the mesa tops retained their virgin cloaks of golden grama.*

BELOW: *Mountain mahogany, heavily browsed by deer. This venerable bush had been chewed on for years—witness the maimed branches within four feet of the ground. It grew on a canyon side where there were many deer and no livestock. (Photograph by the author)*

The most evident of the larger game forms was the white-tailed deer. We saw from three or four to a dozen each day, and tender venison filled the Dutch oven most nights. The local race or subspecies of white-tail is almost the smallest deer in North America; only the diminutive brocket of the tropics is smaller. A large Gavilán buck will weigh 80 pounds, and most of them tip the balance between 60 and 70. Does rarely exceed 50 pounds. In mid-day we found them bedded along the rimrocks or in the heads of brushy draws. A flash of the white flag disappearing down a precipitous slope was usually the only indication that a deer had been jumped. But in the early morning they might be encountered feeding in the open, and it was then that we could obtain our specimens and, incidentally, our camp meat.

The bread-and-butter of the deer diet seemed to be a prickly, knee-high bush called by the Mormon ranchers of Pacheco "Johnny-jump-up" (*Ceanothus huichagorare*). Related species are among the best deer foods in California, and the Chihuahuan representative was no exception. Despite frequent lightning fires (or perhaps because of them?) the Johnny-jump-up was thick on moist slopes, and heavy deer use did not make a dent in the supply. Seasonally acorns are sought by the deer, and they never seemed to miss a chance to nip the tender sprouts of mountain mahogany (*Cercocarpus breviflorus*). In fact the mahogany shrubs were uniformly "high skirted" (see cut) despite the abundance of other foods. In the parlance of U. S. deer managers this would put mahogany in the class of an "ice cream plant"—one so favored by deer that it is commonly overbrowsed regardless of the balance between deer and the total available forage. Under present conditions it would be virtually impossible for the mahogany to reproduce, since seedlings would be eaten as fast as they appeared. How did the existing stands get started? Was this evidence of past "lows" in the deer population? It was a matter of some interest to discover this situation on virgin deer range, since we have come to think of overbrowsing by deer as a *modern* problem following predator control and over-zealous legal protection.

A curious adaptation of the deer to local climatic conditions was reflected in the lateness of fawning. Fawns are born here in August, which is after the summer rains have initiated growth of new vegetation. Farther north in the United States white-tail fawns are dropped in June—the period

Unpressed and a little soiled, but healthy and happy. Left to right: Bob McCabe, the author, Ward Russell, and Alden Miller. (Photograph courtesy of Robert McCabe)

of spring greenery following winter snows and preceding summer droughts. June in Chihuahua, however, is dry—not at all propitious for rearing young deer, or, apparently, young of some other vertebrates. A parallel retardation in the reproductive cycle was observed among the peccaries, wild turkeys, Mearns quail, and some of the smaller birds such as sulphur-bellied flycatchers.

Despite unchecked predation by wolves and mountain lions, the white-tails were abundant. It is a common belief of hunters in the United States that unless the large predators are controlled, a deer population will dwindle to nothingness. Yet a relatively large population of both wolves and lions preyed heavily on the deer without diminishing their numbers unduly. Until the recent arrival of livestock the predators probably lived almost exclusively upon deer. Here was concrete evidence of the much talked of natural balance between predator and prey. We regretted deeply our inability to determine the numerical proportion between the two—that is, the number of lions and wolves supported year in and year out by a given number of deer. The unusual opportunity is now lost, for already the cattlemen are poisoning wolves and the logging camps will dispel all semblance of natural conditions. It was our impression, however, that the deer furnished sustenance for an astonishingly large predator population.

Peccary or jabelí were fairly common in certain localities as judged by tracks and other sign, but they were rarely seen. In manzanita thickets and along the rims of rugged canyons we found fresh rootings and dung almost daily, but as the end of the summer drew near we had encountered the animals only twice and had got but one specimen. I turned my full attention to jabelí hunting, and by elimination decided that the animals must be bedded in daytime on the brushiest and most precipitous slopes since these were the only areas we had not hunted. After several days of scrambling over uninviting terrain I finally located a group of five, bedded down in a thicket of oaks. They consisted of an old sow, two yearlings, and two suckling pigs that could not have been over two weeks old. Four of these made their way into our collection. The sow weighed 52 pounds which was fully as heavy as a large doe. The yearlings presumably were the sow's progeny of 1947 and the piglets constituted the 1948 litter—rather a low reproductive rate when compared to domestic pigs! From rootings and sign we had deduced that jabelí were feeding to a large extent on acorns and manzanita berries, but in addition the stomachs of two of these animals contained large quantities of *green grass.* This should not have been a sur-

The bucks of the Gavilán, as elsewhere, sometimes lock horns in battle and die miserably. Two bleached skulls, picked up by Floyd Johnson on the trail from Pacheco. (Photograph by Robert McCabe)

LEFT: *On our way to tend the wolf traps in the high country. (Photograph by Robert McCabe)*
BELOW: *The big "lobo"—one of our prized specimens. (Author's photograph)*

prise perhaps, since barnyard pigs are known to thrive on greens, but somehow I had not thought of jabelí as grazing animals. We learned nothing of predation on the pigs, but probably they contribute in a small way to the diet of the larger predators.

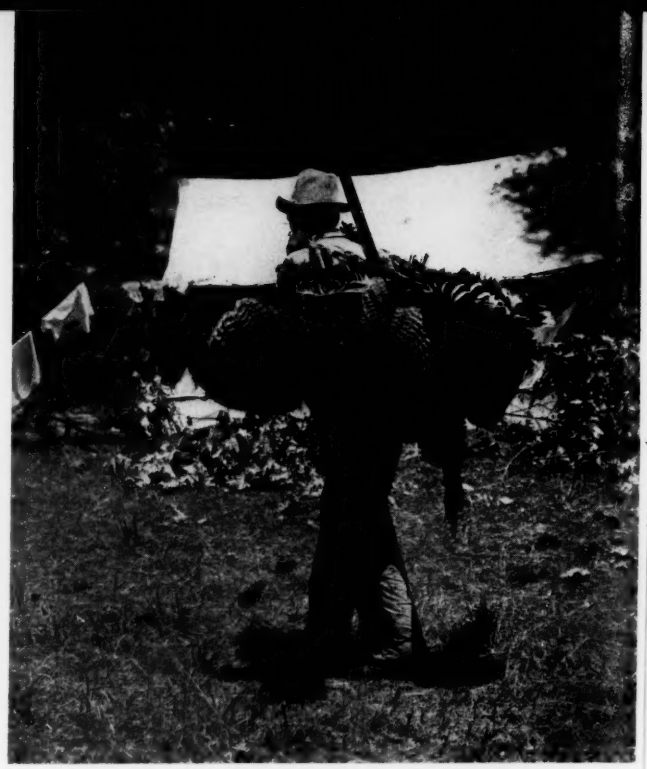
Fresh wolf tracks were seen almost daily, and the deep howls floated down the canyons many an evening. Actually encountering a wolf was a rare stroke of luck. Yet we glimpsed them four times, and two of our encounters yielded shots—both of them successful I am happy to add. One specimen was an adult male, as handsome and powerful an animal as I ever hope to see. The deep muzzle, heavy head and foreparts, and astonishingly long legs were his most striking characters. A forepaw spanned the palm of my hand and overlapped about half an inch—over four inches in length. The stomach of this animal contained a newly born fawn—head, hooves and all, but we were puzzled to find *one extra ear!* It was quickly ascertained that the supernumerary ear was that of an adult, probably the mother of the fawn. In her efforts to defend her young she apparently leaped in too close and had her ear bobbed off as a mark of her valiance.

The other wolf was a young animal about the size of a coyote and probably a year old. Its stomach told a story too, but of a different sort. Present were only chewed shreds of desiccated deer hide, stripped from some old carcass of yesteryear. Young wolves, recently alienated from their parents because of the arrival of a new litter of pups, may have some lean days while they learn to forage for themselves.

Our efforts to trap wolves were, in retrospect, rather ludicrous. For many weeks we tended half a dozen steel traps, painstakingly buried in trails, near baits and beside scent posts; not once did a wolf spring one. They stole our baits, however, and used the trails as before. But they seemed to know the exact location of every trap at all times. The wolves of the wilderness are not naïve!

One interesting sidelight on predator relationships was the *total absence of coyotes* in the wild areas occupied by wolves. Close to Pacheco and around the scattered ranches far downstream from our camp there are many coyotes, but their tracks cease a few miles from the settlements. Wolves presumably keep them out of the back country.

I never really expected to see a mountain lion. The big, mysterious cats are almost entirely noc-



A pair of wild turkeys for the Museum of Vertebrate Zoölogy collection. Breast meat in the Dutch oven for hungry hunters! (Photograph by Robert McCabe)

turnal in habit, and it is rare indeed that one is observed on the move in daylight hours. One foggy morning I slipped quietly over a low rise in the pine forest and two hundred yards ahead on a rocky slope were *three lions* stalking majestically between the boulders. One animal led, and the other two followed forty yards behind. There was little visible difference in size, but I presumed that the leader was a lioness and the others were her grown young of 1947. They were through hunting apparently, for they loafed along, pausing now and then to preen their coats. When the leader stopped the other two held up likewise and kept their distance. I finally shot (without scoring a kill) and sent them all bounding over the boulders. At the time I was bitterly disappointed not to have taken a specimen, but in looking back on the incident I know that the important achievement was to have seen them at all.

On another occasion McCabe and I were hunting turkeys on a steep canyon face near camp when there commenced on the far side of the canyon a powerful roaring, reminiscent of an African lion but of higher pitch and shorter duration. This stirring serenade continued off and on for nearly half an hour. McCabe, who was below me on the slope, could see that the author of the disturbance was a large mountain lion (he guessed a male) parading along the rocky ledges and roaring occasionally as he walked. The observation is of considerable interest, since there has been a long-standing controversy among naturalists as to whether mountain lions roar at all (McCabe is publishing a full description of what he saw). There are some who have hunted lions for years and killed dozens or even hundreds without hearing one give any vocal expression other than a snarl or hiss. For dilettante lion hunters we had our share of luck in making good observations of the animals.

We had other brushes with lions without actually seeing them. A trap was set at a lion scent post and two nights later it made a catch, but the big cat tore out the anchor of the trap (a buried post) and made off with the whole outfit. Another day a turkey gobbler mysteriously flushed from a patch of thick oaks above me and flew directly over my head and out across the canyon. I killed the turkey, but I was so puzzled as to why it should have flown that I returned to the oak thicket to investigate. A fresh lion track came from near my original location and passed directly by the point from which the gobbler had emerged. Bent grass blades in the tracks of the lion were still straightening up in short jerks. The lion must have jumped *very* close to me (yet I heard or saw nothing); evidently he did me the good turn of stampeding the gobbler.

For reasons not at all understood, there were many more turkeys in the Gavilán area in 1948 than there had been in 1937. This suited me completely, for I confess to a strong personal bias for turkey hunting. Miller concentrated on small birds, McCabe on quail, Russell on wolves, and I

Annabelle, our pet coati. Meat scraps and powdered milk supplied her boundless energy, but she much preferred sugar or honey. (Photograph by Robert McCabe)

invested a large part of my time pursuing the big gobblers. On my first trip we had made a rough population estimate of ten birds to the square mile. This was in winter when all the young turkeys were grown. In the summer of 1948 there certainly were more than ten birds to the square mile counting only gobblers and unsuccessful hens that had given up nesting and formed into flocks. The breeding hens and their young were very secretive and we saw them but rarely. By autumn the new crop would perhaps double the observable summer population. The obvious fluctuation in turkey numbers was an unexplained but interesting point.

Our observations on the summer behavior and general natural history of the turkeys revealed nothing startling or new but tended rather to substantiate our meager knowledge of the birds. Preferred foods at this season were acorns, manzanita berries, and assorted greens. The sexes tended to segregate as is normal for the species, adult gobblers flocking independently of hens and young males. One flock of a dozen very handsome old males outwitted us through most of the summer, and it was only in the last week or so that we finally succeeded in bagging two of them. The breeding season is retarded as mentioned above, gobbling occurring mostly in May and early June according to Floyd Johnson, our packer. This throws the hatching period into July and August —only slightly earlier than the period of fawning in the deer.

In all we collected nine adult turkeys—a valuable series of skins for the museum, even though some of the birds were molting and in somewhat ragged plumage. Wild turkeys from Mexico are but poorly represented in most museums. The adult gobblers weighed from 15 to 17 pounds, the hens from 8 to 10 pounds. Needless to say, slabs of tender white breast meat were duly appreciated on the supper table.

The handsome little Mearns quail kept McCabe busy most of the time and intermittently occupied the attention of us all. So little is known of this quail that we made a special effort to gather life history data for some future report. Whereas turkeys had increased in the past decade, the Mearns quail had suffered a decrease of at least equal proportion. Johnson shed some light on this by telling of a very severe winter in 1944-45 which seemed to wipe out the quail throughout much of the high country. Heavy snow and temperatures down to 20 below were more than they could withstand. They were coming back, however, and we found enough to justify our attention.

Mearns quail are diggers. Most of their sustenance is scratched from the ground, and the best way to locate them is to watch for their scratchings. Elsewhere in Mexico I had found the birds eating a variety of small bulbs and fleshy roots, and here likewise they showed the same dietary preferences. A good many insect pupae are unearthed and consumed in these operations, but underground plant foods are the "staples." A few quail crops contained acorns and surface insects such as leaf-hoppers. The first newly hatched brood was seen on July 20, but most nests came off in August. The adults were expert at distracting attention while the chicks scattered and "froze" in the grass, and we spent many an hour on hands and knees attempting to find the young ones. One little hen hovered like a hummingbird before the face of my horse one morning while her chicks dispersed. The ruse was successful too, for in our enchantment with the behavior of the mother we failed to mark the hiding places of the young.

There were many other species of equal interest. Band-tailed pigeons raced low over the mesas in their regular flights to water and to distant feeding grounds. We found several of their flimsy nests in low oaks, each with a single egg or squab balanced precariously on a few twigs. Hog-nosed skunks, in their search for grubs, plowed up the riverbottoms every night and left more sign even than jabelí. We never saw them during the day and had to collect specimens at night with a jack-

One of the innumerable stone terraces built by ancient Indians who lived on the Gavilán. The stones were fitted into place without cementing, and many of the structures are quite intact today. (Photograph by the author)

light. In the same manner we hunted raccoons, owls, and poor-wills. Coatis, closely related to the raccoons, are more likely to be abroad in daylight and two adults were collected in the course of normal hunting operations. Likewise we acquired two juveniles as pets, and watching them was both entertaining and instructive. One became ill in the course of time and had to be dispatched, but the other returnd to Berkeley with us and is now nearly full grown.

Thick-billed parrots frequented the high pine mesas, and their resonant cries penetrated even the deepest canyons. In flight these parrots are reminiscent of ducks as they circle high in the sky, then tumble down to their feeding grounds—the groves of cone-bearing yellow pines (*Pinus macrophylla*). Putting up parrot skins proved to be an ordeal, for the birds are most disorderly in their eating habits and pitch from the green cones covered their faces and breast feathers. Each skin had to be scrubbed in gasoline (completely "dry cleaned") before the cotton body was inserted.

In the groves of tall oaks, particularly those draped with wild grape tangles, coppery-tailed trogons flashed their red breasts and irridescent green backs. Mexican crossbills, evening grosbeaks, acorn woodpeckers, and a galaxy of warblers and flycatchers all added their songs and colors to the sunny mornings, and promptly disappeared when the afternoon thunderheads gathered.

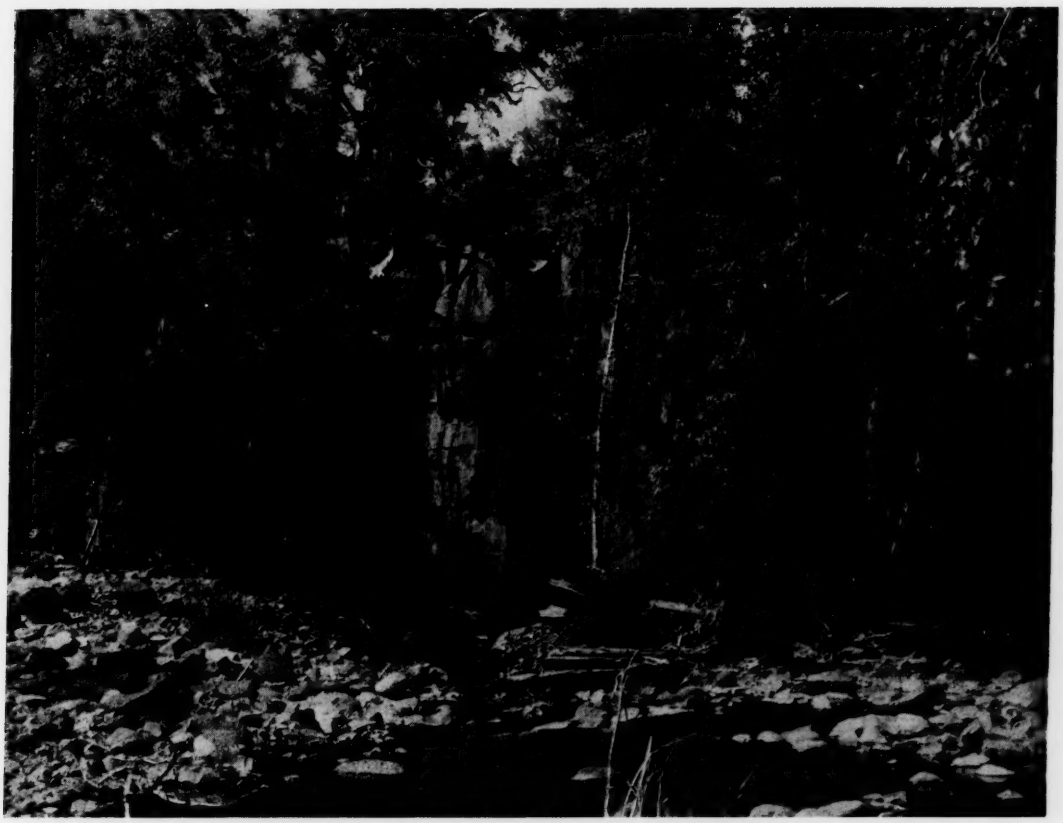
All told we collected over 900 specimens of vertebrates, including individuals of every species encountered except the mountain lion. A small plant collection was preserved too, the plants selected being in large part those that bore some important relationship to the bird and mammal populations. Of equal value and importance were our bulging notebooks—written records of what we had learned from day to day.

Although none of us had any background in archeology, we were interested in the abundant traces of an ancient Indian culture that had thrived here and then disappeared before the Spanish Conquest. In the head of almost every draw could be found stone terraces or check-dams, each one retaining a plot of level soil. The tiny fields, rarely 100 feet in length, presumably had been tilled by the Indians in crops of native beans, squash or maize. The rock masonry was skillfully laid, for some of the dams were completely intact, centuries after their abandonment. A staggering amount of hand labor went into their construction.

Near our camp were traces of an ancient city or ceremonial gathering place. A "council ring" of heavy stones, a masonry "fort," rocks inscribed with primitive hieroglyphics, and accumulated potsherds marked the spot as an important center of activity. Who were these people? Being agriculturalists, why did they choose so steep and rocky a country for their home? What made them leave? Carl Lumholtz, pioneer ethnologist of western Mexico, explored this region in the early years of the present century and apparently was much taken by the ruins of "Casas Grandes culture." But no one has since added to his initial descriptions of the culture. We wondered about the status of forests and game during the height of Indian occupation. Perhaps then the country was largely cleared. If the Indians were hunters, game would

ABOVE: *Stone "writings" of Casas Grandes culture. Floyd Johnson pointed out this rock to us within a quarter-mile of our camp on the Gavilán.*

BELOW: *Metate and skull of Casas Grandes culture, now in the possession of Floyd Johnson of Pacheco, Chihuahua. (Photographs by Robert McCabe)*



The Gavilán at low stage, showing cobblestones and debris left by recent floods. Elevation of the river at this point is 5,700 feet. (Photograph by Robert McCabe)

have been scarce. The present era of clearing and occupation, in that light, is not a *new* experience for the Gavilán—merely history repeating itself.

Summer waned and the hour of departure arrived. On August 25, when the last recalcitrant mule was packed, we turned our horses up the familiar trail to "top out" for the final time. What can we expect to find when next we return? Will there still be wolves to howl at dusk? Will young pines have filled the places of the fallen patriarchs? Will even higher floods scour the river course? I fear to hazard a guess. Certain it is, however, that the wilderness will be gone. Ubiquitous man has claimed even the Gavilán.

Though I lament the passing of the wilderness, I mean to pick no quarrel with civilization as a whole; automobiles, modern houses, and beefsteaks are as much appreciated by me as by anyone else. I question merely its universal spread. The Gavilán can offer little to the "good life." It will produce some beef and some lumber and then probably be left stripped and gutted to its basaltic core. Might it not have yielded more the way it was? Must there be a cow on *every* hill, a road in *every* valley?

In the United States we are making some progress toward preserving examples of primitive America. The National Park Service and the U. S. Forest Service have set aside some magnificent areas for preservation in the natural state. These and other remnants of unspoiled country are being stoutly defended by a little band of patriots, poor in purse but rich in spirit, who have joined to form a Wilderness Society. But in Mexico, the wilderness is still on its own.

I would like to think that there is another river filtering off hillsides of golden grama and winding under virgin pine. May my son some day explore its rimrocks and imagine there are still Apaches in its tributaries.

Alice Eastwood in 1912. (Photograph by Dr. G. A. Eisen)

LEROY ABRAMS

Alice Eastwood—Western Botanist

IT WAS ABOUT THE TURN OF THE CENTURY when I first met Alice Eastwood. I was then a student at Stanford University, and was making my first visit to the California Academy of Sciences, which at that time was located on downtown Market Street in San Francisco.

Miss Eastwood greeted me with the warm, friendly spirit that is so characteristic of her, and showed me where to find the particular plants I wanted to see. She showed genuine, enthusiastic interest in the work I was doing and discussed various phases of the problem with understanding and vigor. At noon, that day, Dr. H. H. Behr, the fine old gentleman who was the Academy's specialist on Lepidoptera, came in from his laboratories, as was his custom, for luncheon, and I was invited to join them. The kindly interest of both Dr. Behr and Miss Eastwood made my visit a memorable one. I mention the warmth and friendliness of the atmosphere in the Academy herbarium that day long ago because one still finds the same spirit there today—a blending of a rare quality of friendliness, enthusiasm, and energy.

The San Francisco earthquake and fire of April 1906 destroyed the old Academy building and all the collections. Everything, that is, except the types of plant species—and very little else. The saving of the plant types can be credited to the

wise curatorial practices instituted by Miss Eastwood, as well as to the ingenuity and courage she showed the morning of the disaster.

In the first place, those irreplaceable types could not have been saved ahead of the advancing flames had they not been segregated from the main collections and placed in a special herbarium case. Credit for this segregation must be given to Miss Eastwood, for I know of no other institution either in this country or abroad which at that time kept its types in a special unit. Then, too, it took courage and boundless unselfishness to neglect entirely one's own personal welfare and safety that fateful morning. Alice Eastwood had both.

Unmindful of imminent danger to her home and to herself, she got down to Market Street and made her way into the quake-shattered Academy building through an adjoining store, accompanied by a friend, Robert Porter, whom she found by chance on the street. Once inside—the front door was locked—they climbed the broken marble staircase to the museum by holding to the iron railing and putting their feet between the rungs. With flames roaring into nearby buildings, Miss Eastwood coolly gathered up the priceless herbarium types; she and Porter lowered them to the ground floor with improvised ropes. Meanwhile the Academy's director, Mr. L. M. Loomis, and a few others who had reached the building, were collecting insect, reptile, and other types, a few irreplaceable books, and the Academy's records, and moving them to the street. From there Miss Eastwood with Porter's help got the rescued objects across Market, she staying with them till an express wagon was engaged to take them to her home. When fire threatened that, she and her friends carried "the Academy" by hand to Russian Hill, whence everything was finally moved to Fort Mason.

She lost all her own possessions—"Not a book was I able to save, nor a single thing of my own, except my favorite lens, without which I should feel helpless"—but through her effort the Academy possesses over 1,000 of the most valued plant specimens from the old herbarium, rare specimens and books from other departments, and its cherished records going back unbroken to the first meeting in 1853. Her determination to save the types, and her levelheaded action in selecting the most valuable items instead of sacrificing precious minutes in attempting to remove other important, but replaceable, specimens and books, rendered a service to science—to botany—that few are privileged,

ABOVE: *Entrance to the old California Academy of Sciences building on Market Street, San Francisco, before the earthquake and fire in 1906. (Drawing from the California Illustrated Magazine, January 1893)*

RIGHT: *The Academy building was a heap of rubble and a gaping hole in its block after the fire. (Contemporary photograph)*

or able, to give. That courageous action has been praised by her colleagues ever since and will be remembered for many, many years.

For several years after the fire, until the new building of the Academy was completed in Golden Gate Park, Miss Eastwood was a free-lance botanist who spent her time profitably, collecting plants later to become the nucleus of a new herbarium, and in studying types of western plants in the older institutions of the eastern United States and in Europe. Among the herbaria she visited during this period were the United States National Herbarium, that of the New York Botanical Garden, and the Gray Herbarium at Harvard University; and in Europe, the Lindley Herbarium at Cambridge, England, the one at the British Museum in London, and the splendid herbarium of the Royal Botanic Gardens at Kew, England. Annotated labels attached to sheets scattered through the folders of numerous families in these and other herbaria attest to the breadth of her interest and the energy with which she attempted to crowd just as much work as possible into every working day.

When the new Academy building (North American Hall) was completed in Golden Gate Park in 1916, Miss Eastwood was again Curator of the Herbarium. With the bundles of types saved from the fire, with material she had collected in the interim, and with the rich collections of the Academy Expedition to the Galápagos Islands in 1905-1906 (which fortunately did not reach San Francisco until after the fire), she began again to build up a working herbarium including both native and cultivated plants. Owing to the shortage of funds with which to purchase large sets of herbarium specimens collected by others, Miss Eastwood devoted her vacation periods and many holidays to collecting large sets of plants from many parts of the western United States. The first set of each collection was reserved for the California Academy; all the duplicates were exchanged with other institutions for specimens collected by their staff members. In this manner she added thousands of sheets to the Academy's herbarium, personally accounting for its steady, year in and year out growth in size and increase in representation of the western flora. As concrete evidence of the energetic collecting campaign Miss Eastwood carried on for nearly four decades, one finds specimens in many herbaria bearing the characteristic, hand written labels of Alice Eastwood, collected in the high meadows of Colorado, on isolated mountain peaks in southern Utah, from infrequently visited spots in Arizona, Nevada, Idaho, and Oregon, from the deserts of the Southwest and the rain-drenched forests of western Washington, and from dozens of other localities that indicate she crisscrossed the western part of North America from east to west and north to south time after time. Difficult terrain held no terror for her. She went anywhere a mule could carry her—and into many places where no mule could possibly go!

Nor were her collections remarkable because of their quantity only. She had, and still possesses, a keen memory for minute characters, for the type localities of many species, and for the rare things collected seldom after the first gathering. As a result she has often recognized undescribed species in the field, or a plant known previously only from the original collection, or a variant from the norm of the population making up the species, that would have been overlooked by a less observant field worker.

The purely mechanical and routine tasks of tak-

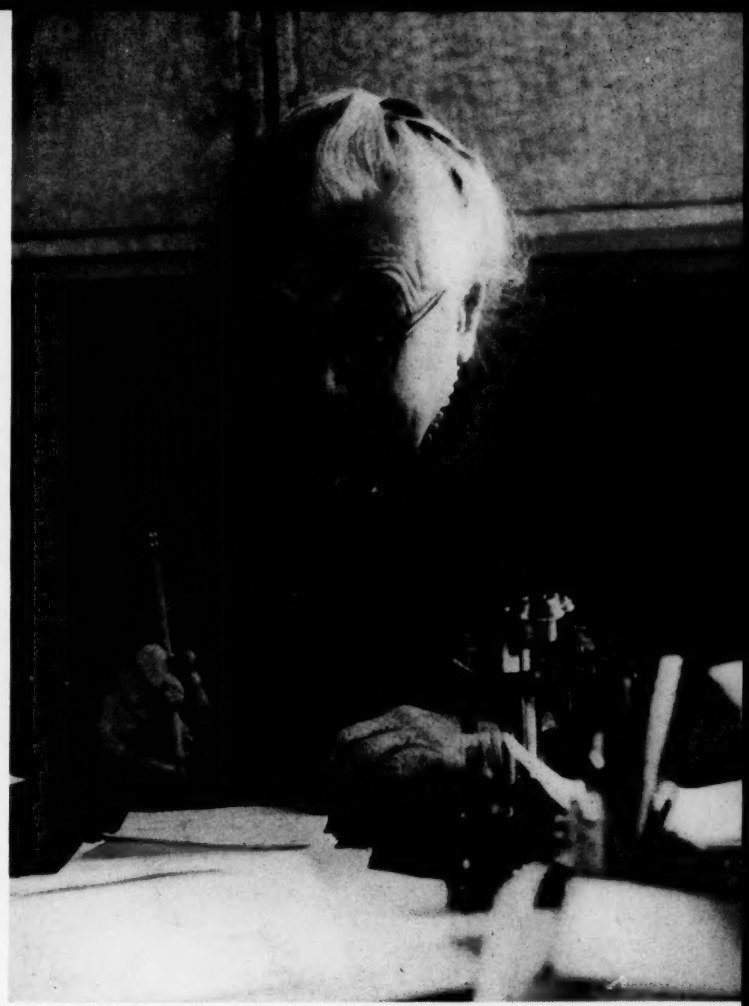
She went anywhere a mule would go, and many places "no mule could possibly go!" This was in the Salmon-Trinity Alps of northern California, 1901. The botanist with the forty-niner whiskers is Dr. Kaspar Pischel. The other muleskinner is Mr. S. L. Berry. Only Miss Eastwood looks completely happy. (Yes, we know the two equine quadrupeds are horses, not mules!)

ing care of the herbarium and its mounting number of specimens were enough to tax the strength of most, but Miss Eastwood carried such duties along as a matter of course, and found time—one often wonders how—to keep a steady series of papers going through the presses. She wrote about plants indigenous in the areas from Alaska to Mexico and eastward through the Rocky Mountains. Many of them were written in a semi-popular style interesting to the layman and the professional botanist alike. Others were monographic in scope and as technical as taxonomic papers often have to be. A collection of plants from some area known incompletely was a challenge she rarely refused to accept, with the result that she published accounts of the floristic makeup of the vegetation in many parts of the country.

So, through the years, laboring with zest and enthusiasm in field and herbarium, at times handicapped by lack of funds with which to carry forward her dream of making the herbarium of the California Academy of Sciences an outstanding one, she kept pushing on, sometimes alone, but for a number of years with the able help of Mr. John Thomas Howell and loyal friends who volunteered their services, striving constantly toward the realization of that dream. Now, as she retires at ninety from active responsibility for the herbarium, she has admirably achieved her ambition, for the herbarium of the California Academy of Sciences includes an excellent representation of the flora of western North America within its cases, and thousands of plants from other parts of the world. The Academy may well be proud of its herbarium and of the botanical work being done there.

Although Miss Eastwood has never taught botany professionally, she has interested more people in plants and plant life than has any other person in California or the West. Whether it is among garden plants or native wild flowers, she is equally at home, and can talk about them intelligently and enthusiastically. Consequently, she is widely sought as a speaker and advisor by garden clubs and other organizations. Everywhere, whether in the Bay Region, southern California, or any other part of the state, garden club members and many others interested in plants are enthusiastic in their praise of Miss Alice Eastwood.

Retiring as Curator of the Herbarium though she is, her friends are sure there will be no diminution in Miss Eastwood's devotion to systematic botany and to the institution she has served so loyally for more than half a century. They know her enthusiasm will continue, that she will keep in close touch with her many friends, and that she will go right on giving encouragement and advice to those seeking information about native and cultivated plants. Retirement from the curatorship will never lessen Alice Eastwood's consuming interest in plants and in people who share that interest.



Miss Alice Eastwood at 80, at the beginning of another ten years as Curator of Botany in the California Academy of Sciences. (Photograph by Frank L. Rogers)

On January 19, 1949, her ninetieth birthday, Miss Alice Eastwood retired at her own request from her position as Curator of Botany in the California Academy of Sciences, becoming Curator Emeritus.

Dunes and palms on the edge of the Sahara, in the oasis of Colomb-Béchar, Algeria.

BORYS MALKIN

SAHARAN contrasts

Second of a series of reports direct to *PD* from Africa by Mr. Borys Malkin, Academy Research Associate in Entomology, whose one-man research and collecting expedition into Equatorial Africa is sponsored by the Academy's Department of Insects. His first African report appeared in *PD,* November-December 1948, as "Trails out of Tripoli."

Articles under our heading "Roads to Discovery" emphasize travel and conditions in the field through information reported direct to *PD* by field naturalists, most of whose travel is off the regular tourist routes.

Lagos, Nigeria. December 6, 1948

DEAR DON:

From an armchair in my room in London, it was so easy to plan my journey from Tripoli to Alger, thence across the Sahara and the Sudan to Lagos on the Gulf of Guinea. But actual operations were far from smooth, as you will see.

To Alger I came by ways various and not always recommendable. From Tripoli I went by bus to Tunis, thence by train to Alger. I do not recommend either—for rest. En route I stopped in several places in Tunisia—Gabes, Sousse, Carthage. Gabes and Sousse are on the low flatlands, once an extension of the sea. There is much salt on the surface of the ground; the flora and fauna are meager. I also went off to Kairouan, but after seeing the Arab part of Sfax it was somehow disappointing. Carthage, on the other hand, I liked—a very pleasant place once you learn to ignore the eager guides and other priests of knowledge. Of the ancient city there is not very much still standing; but, as the archeological museum in Carthage shows, an enormous amount of material has been unearthed which illustrates the life of the early inhabitants.

Once in Alger, I was tied to a standstill for over three weeks in French red tape. The day I arrived, October 13, had to be a holiday, which cost me several days. Then I went up to the Prefecture, hoping to obtain pronto a transit visa across French Equatorial Africa. No such thing. Authority for the issuance of a visa must come from the Gouverneur General d'Afrique Occidentale Française in Dakar. "We will send the telegram," they said in Alger. Thereupon I cheerfully walked away and went about my business, taking trips into the desert, and returned eight days later to find no wire had been sent. I raised hell and the wire went off. "You must wait six to eight days more," they said. I did, and more. Ten days later a telegraphic reply came which floored me: "No visa until we see his 'formulaire.' " So they sent the "formulaire."

With more waiting in store I decided that shorter, more frequent trips would be more profitable than longer expeditions out of Alger. I kept within a radius of 100 miles from the city, except for one trip to Bou Saada, the nearest point on the desert.

This part of Africa did not impress me too much. It is much like the other Mediterranean shores I've seen, but less interesting. There is not the scenic variety I found in Italy or Sicily. It is largely a cultivated country, with a number of different crops; olives grow on the hill slopes, especially where it is dry. But south of Alger the mountains rise to more than 3,000 feet and in their upper reaches scrub oaks grow, and graceful pines. Over the crest, forest suddenly vanishes and the southern side opens to desert. Farther inland another range of hills rises, in which one finds, unexpectedly, a forest of sizable junipers.

The insect fauna was not too interesting and greatly impoverished, doubtless because of the late season. After I came here, cold, drenching winter rains set

in, one after another, driving the insects under cover. So my field work was hampered by nature as well as by French officialism. Insect life is so largely Palearctic or Euro-asiatic in the coastal region that I could name on sight most of the beetle genera.

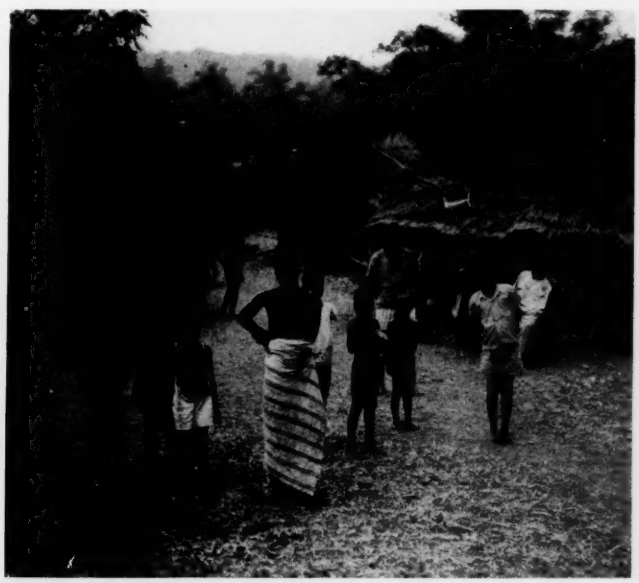
Much more interesting was the trip to Bou Saada on the edge of the Sahara about 170 miles south of Alger. Here is a good example of stony desert, very different from the sands of Tripolitania. There are fine rock formations, with multicolored, folded strata. Saharan fauna, though poor, proved very different from the coastal. It was here I uncovered for the first time the Embioptera Ed Ross [Dr. Edward S. Ross, Curator of Insects in the California Academy of Sciences—Ed.] commissioned me to get for his special study of the world distribution of this little known Order. I found a colony of nearly thirty of them under one stone along the highway at the base of a wall where water trickled down near by. You may know these insects who can run backwards and forwards with equal agility like crabs and who spin curious silken tunnels. I'm sure I missed them in Tripolitania because I failed to distinguish their tunnels from the work of certain spiders. Now I know the trick, and dug up Embioptera on practically every side trip out of Alger.

On one of these trips I came under full blast of the French suspicion of foreigners. I had gone to Tipasa, some 60 miles west of Alger on the coast. Well preserved Roman ruins are there, and I wanted to see them, photograph them, and collect among them. I accomplished all but the picture-taking. Instead of returning to the ruins in the afternoon as I had planned, with the camera, I spent three hours in the local—jail. An endemic Cerberus asked me for "papiers." They worship the "Carte Identité" in these parts. It so happened I did not carry my passport on this trip (I usually do). I speak not a word of French. All this was not to the good. They led me away to the penal establishment, relieved me of my collecting knife, penknife, camera, light meter, and a 1:500,000 map of the area, and locked me in. There was a fine cricket in the cell but the brute got away before I could lay my hands on him. I was feeling thoroughly frustrated when, after three hours, they let me out—happily convinced by that time, I guess, that I was no more than an innocuous if slightly deranged naturalist. Next they offered me a drink, then rang up the U. S. Consulate in Alger where I was identified as myself. That was the end of that, but it explains why no pictures of Tipasa in this letter.

Visa at last—and I was off from Alger to Colomb-Béchar, a ghastly rail trip. Eight adults and three small children cooped up in the second class compartment (I dared not find out what third class was like) of a very small car on a narrow gauge line. Baggage was scattered, plugged into every space not occupied by human bodies. Fortunately the nights are very cool in the uplands—if you can call it lucky to have got a nasty cold from a draft through a window broken by some sudden and unexplained jolt. At least we weren't sizzling and frying as en route from Tunis to Alger.

The seven day wait at Colomb-Béchar for trans-Saharan transport I spent resting up with coffee-and-rum plus aspirin, and going afield every morning and afternoon. Collecting in the desert is much like diamond prospecting; if you add a couple of species per day to your bag you are lucky.

This part of Algeria, indeed, is more of a desert than any other place I have ever seen, something to be realized in large scale only outside the North American continent. I know of no place in the United States that is such absolute desert. I checked rainfall charts. The record of the past 30 years shows an average of somewhat under two inches per year. Of course there is no regularity about the precipitation,



Contrast in dwellings. Left, Arab house of mud-brick and rubble, Colomb-Béchar, Algeria. Above, Negro village of mud, poles, and thatch, Bimbèrekè, Dahomey. Both types of house are built of materials at hand or close to the site. Here are extremes from the northern Sahara and the Equatorial belt to the south of the great desert.

Weathered strata of the canyon wall near Colomb-Béchar.

and there are more rainless years than rainy. A local resident missionary of the White Fathers order (with whom I conversed in Italian for lack of other means) told me there had been no rain during the last four years. Yet when it does rain it comes down in torrents. Everywhere I went there were signs of violent flooding rains in the past.

One day I went up to the mountains surrounding Colomb-Béchar. Flat country stretches due east four miles from the town, then suddenly at the point of a tiny oasis the land rises to nearly 2,000 feet above the level ground. Like so much of the country I've seen in my North African travels, that around Colomb-Béchar forms a high plateau. Consequently there are no jagged peaks nor steep pinnacles to climb. Within less than an hour I was on top, and there I spent possibly the pleasantest couple of hours since I left Tripolitania.

It was early afternoon yet the air was not very hot—cold, in fact, in the shade, reminding me it was winter here as well as in America—ideal weather for walking. I had my lunch of bread, an orange, and hot water with wine and sugar (Malkin patent) from the canteen, then proceeded to look around and photograph the deep canyon below and the beautiful formations of red sandstone. It was extraordinarily quiet. No vegetation in sight, nor any kind of animal. Yet it is not lifeless land. In due time a lonely great vulture soared close, gliding in the air almost motionless. In the distance on a rock two small animals appeared. They looked like squirrels with long, bushy tails, but with no binoculars I couldn't make them out. I turned several stones, but nothing ventured to live here that couldn't fly—or so it seemed. Yet, as I climbed up hill I disturbed several microlepidoptera. I saw a few lizards, all of the genus *Acanthodactylus,* perfectly adapted to desert life with fringed fingers to help them in the sand. Specimens I saw in the lower sandy areas were pallid yellowish brown; but those here among the dark rocks were brown. Believe in the color adaptation theory or not, it has some basis if you allow it enough flexibility.

From my point on the edge of the plateau I looked far toward the Moroccan border some 20 miles away, and into the desert. Below the escarpment it was quite level, except for mesas standing here and there to remind one of the gnawing teeth of time.

In midafternoon I started back to the valley, following the path of the stream—that is, a line of boulders running down where the stream flows in the fat years of rainfall. Although the desert around is without plant life of any permanence, here vegetation appeared in bushes and lesser growth. I counted up, quite casually, seventeen species of plants along my route, and certainly a botanist would have found more.

It was interesting to compare Colomb-Béchar itself with Bou Saada. Both are oases; yet what a difference! In Bou Saada, much nearer the coast, there is rich vegetation of varied kinds, with vines and grasses. Along the watercourse in Colomb-Béchar only the date palm grows, with little grass, and shrubby eucalypti where they have been planted. The only other tree is the tamarisk in the city; even the olive is scarce. Nor can much be said for animal life. I found mosquito larvae in water but no other insects. There were a few frogs, however, and this made me think the paucity of life in general was owing partly to the winter season.

The population here is Arab with a certain admixture of Berber. Already the negroid influences are strong; a large proportion of the people are Mohammedan Negroes. Black or lighter, they are all Arab

Looking down the dry watercourse with its sparse vegetation, near Colomb - Béchar.

in culture, living in the usual fashion along the watercourse, partly supporting themselves by cultivation of vegetables (fruits are very scarce here), partly employed in mines and in the local government in menial capacities. Houses in the oasis are all of mud brick—the adobe of our Southwest. (This illustrates well how under similar circumstances men often arrive independently at similar solutions of a problem—but not invariably; the desert-dwelling Australian aborigines don't build mud-brick houses, or any other kind.)

Despite apparent uniformity of landscape, topographic features here are varied. There are sand dunes, for example, which offer to the naturalist a very different view from rocky ground. On them the fish which at noon were hard to catch offered no resistance during the cold hours.

Collecting here was poor. But no one must expect much of the complete desert, except perhaps in those rarest of times when water pours plentifully from the sky. In the main I found the fauna a repetition of that in Tripolitania, with *Pimelia* (three species) and another Tenebrionid genus I don't know most numerous.

The striking fact of collecting at Colomb-Béchar at this time seemed to be the predominance of large insect forms. One would like to ponder the reason. Is it the desert winter with its extreme cold at night which so limits the fauna? The desert, like the Arctic and the ocean depths, represents an extreme ecological condi-

Modern "ship of the desert." Author, to right, and another passenger beside the huge Renault truck operated by the Compagnie Generale Transsaharienne. Near Reggane, Algeria. Here the Sahara is table-flat, and all but lifeless.

relative wealth of reptile life in the desert can best be realized. I confess I saw not a single animal of that class, but plenty of tracks to tell the story. Some tracks were undoubtedly those of snakes; others were almost certainly made by some sort of short-legged lizard. Some ended in burrows, setting a hard task for the trapper. I suppose most of these animals were strictly nocturnal. But for the miserable cold I caught on the train I might have sat up for them, even though the nights were shivering.

Indeed, this is a cold country. When I went collecting in the early morning most animals appeared stiff and almost paralyzed by the low temperature. The same darkling beetle *Pimelia* which in Tripolitania would walk briskly about in the morning appeared sluggish here. Even the usually quick silver tion. In cold climates, we know, animals are on the whole larger than in warmer parts of the earth—or rather, putting it the other way around, there is an absence of small animals. This rule is not supposed to apply to the invertebrates, but perhaps something of this sort operates in the deserts in winter. Or is it the lack of herbaceous detritus which prevents many small forms from surviving? Here in the desert there are virtually no tiny forms such as the springtails and mites, for example, which in temperate forests make the numerical bulk of the invertebrate population. Although my desert collecting has yielded many Tenebrionids, the larger forms of this family have dominated. There are many small species, naturally, but these (judging from the Museo Libico collection) are more numerous in the spring. What fauna I found

Contrasts in landscape, from desert to savannah. Four stages of vegetation or "cover" in West Africa. Left, naked dunes of the Great Western Erg, Algeria. Left center, pre-desert steppe south of Bidon 5, Algeria—clump vegetation, little water. Note dead

seemed to be centered largely around human settlements. Tenebrionids, for example, which comprise nearly half the desert fauna, feed on refuse, including human excrement. There is little for these insects to eat in the desert.

It must be admitted I am generalizing from my very limited experience. Of all places seen thus far only the Libyan upland (the coast must be ruled out) and the Colomb-Béchar area exemplify extreme desert conditions. Due allowance must be made for the possibility my observations are quite local and not widely applicable.

THREE MONTHS TO A DAY after my landing in Africa I reached the parts which surely belong to the "Dark Continent." I was in Gao on the Niger—in the heart of the French Sudan. Instead of giving you a general account of my journey across the Sahara from Colomb-Béchar, I'll quote from my diary day by day.

NOVEMBER 17. Depart from C.B. at noon. The vehicle is a huge Renault, monstrous indeed. While the truck serves mainly as a freight carrier, it also accommodates passengers (not more than five) in a cabin immediately behind the driver and his two helpers. Our driver is an Arab, or perhaps—as he claims—a Turk, a man of enormous size in any direction you like, quite fit to command the great machine.

Beni Abbès—arrived just before dark. First overnight stop in a fine and pleasant hotel. It is clean—a rare thing in North Africa. Not even a roach. The hotel is full of colorful soldiers who are being used here in the shooting of a film about the desert.

From Colomb-Béchar on, the elevation of the country steadily declines. It is 1,000 feet lower at Beni Abbès. First, the road goes between mountains which are a continuation of those surrounding Colomb-Béchar. Signs of fantastic folding and contortion are everywhere. Eventually the bright-hued rocks give way to flatter land of almost black color that creates a gloomy feeling. There are many mesas that from the speeding truck look like basalt. Sometimes elevation or other signs by the road seemed to be suspended in the air. I thought, at first, I was seeing salt flats in the distance, but then it became obvious these were mirages, compounded of reflected glare from sand-polished rocks plus tricking of the mind.

Bypassed Tarhit, then came within sight of the *Grand Erg Occidental,* or Great Western Erg, an enormous body of red and yellow sand dunes extending for hundreds of miles. The black level desert is marked off very clearly from the red sands. Is there any difference in the fauna of the two, beyond the probability that the dunes are even poorer? The dunes seem to be running from the southwest to the northeast [an observation borne out by study of a physical map of northwestern Africa, 1:5,000,000 scale; this

Petrified wood on the desert near Reggane, Algeria (see footnote, p 23).

gazelle in foreground. Right center, Niger River flowing through savannah well-clothed with grasses and scrub. Right, high savannah near Halifia, Dahomey—tall grasses covering openly wooded country. Next stage in this sequence is "wet" vegetation.

trend of the shifting sand dunes, or *erg* (pl. *areg*), is a phenomenon of wide extent on the Sahara—ED.]. In early afternoon we reached Igli, a small settlement right on the edge of the Great Erg. Beyond Igli the desert becomes even more level and lifeless.

NOVEMBER 18. Adrar. At the Beni Abbès hotel, a knock on my door at 2 A.M. Left Beni Abbès at 3. Stop for coffee at the station of Kerzaz, 7 A.M. Heading toward Sba, still within the dunes of the Great Erg, reaching it for lunch. Getting off, I learned a practical lesson: in spite of sweater and heavy combat jacket I am cold except when exposed to the full sun rays. The desert is *cold* this time of year! (In In-Salah on the Eastern—Ahaggar—route about 200 miles east of here, the temperature falls off from a peak of 99° F. in July to 68° in November, hitting a low of 55° in January. This presumably represents also the conditions along my route.)

Sba is a small village, apparently without French settlers. The populace shows increasing Negro mixture, though the majority is still Arab. Reached Adrar in half an hour from Sba.

Adrar is built of red mud-brick around a great square, the predominant town plan in the Sahara. Visited the White Fathers missionaries—three of them. As usual in a Moslem country, they don't make much headway in converting—three converts, all children. Here the ethnic tide has turned in favor of the Negro influence over the Arab. Collecting poor; a few microlepidoptera at lights, two species of snail in a small stream.

NOVEMBER 19. Reggane. From this point on no hotels, only encampments for the next four days. Got here at noon after shortest leg of the trip; the day cloudy and hazy but getting warmer. The ground is level for miles around. We had stopped a few miles north of here with a flat tire. That gave me time to wander about and discover splinters which looked like fossilized wood. At first I doubted my find, for wind-driven sand does strange things to rock. A larger fragment, however, with unmistakable tree rings dispelled doubt.* Later, near Reggane, large logs on the eroded slope of a hill showed very well that this has not always been desert.

Toward evening I wandered into the village. A Negro-Arab woman invited me into her hut for tea. I watched her light the fire with a stone. It is plain that such stones after much use may readily be taken for ancient artifacts. This throws suspicion on some of the surface finds throughout the Sahara, such as those of the Cufra and Fezzan oases.

NOVEMBER 20. Bidon 5. A peculiar name befitting a peculiar place. The strangeness lies in its utter isolation. It is an encampment of five metal huts, a small building for a radio station, and a storage house. The whole is manned by four people, two of them army radio men.

This was the longest stretch, about 275 "milles" or 520 kilometers. Left Reggane at 1 A.M.; arrived at Bidon 5 at 9 P.M. The road—a desert track left by cars which came over earlier. If it gets tough the driver veers off a few hundred yards and travels on virgin ground parallel to the old track. The land is flat and absolutely lifeless.

* The paleobotanist Dr. Ralph W. Chaney, Curator of the Museum of Paleontology in the University of California, has kindly supplied the following note on fossil plants in that part of the Sahara traversed by the author:

The fossil record from the Cretaceous period indicates moist, isolated valleys in which lived palms (fossils common), an angiosperm of the legume family, persimmon, and water lilies and ferns.—ED.

At noon we reached a post, a hut apparently serving for emergency gasoline storage. Lunch. Inside the hut a few dead birds: two swallows, a heron, and one I don't know. Shake the heron and a single Nitidulid beetle falls out. Around the hut are a few small dragonflies. Apparently these rest inside and hunt the flies that are about in small numbers thriving on human refuse. A settlement about 70 km. to the east is the nearest possible breeding place for the dragonflies, but considering the prevailing wind direction it is more likely they came from an oasis 300 km. to the southwest.

NOVEMBER 21. Tessalit, French Sudan. Out of Algerian territory. Not only a political transition, but also botanical and faunal. Half way before we reach Tessalit grass appears gradually, then more frequently until it develops into a poor park-steppe with widely scattered mimosas. The transition is quite sudden, that is, within 100 km. from the desert to what the French call "Zone Sahalienne." So the Central Sahara with its poverty of life is behind. (Parenthetically, Good in *The Geography of the Flowering Plants* [1947] lists 300 plants for the Central Sahara. These I suppose come mostly from the high oases of the Ahaggar and Tibesti mountains, where great elevation—up to 11,000 feet in the Tibesti—brings increasing humidity. For Tibesti, for example, the Italians list 44 species of beetles [19 of which are Tenebrionids, 7 weevils]. But one would have a hard time finding half as many species in the whole year in the sandy and flat wastelands, let's say between Adrar and Bidon 5.)

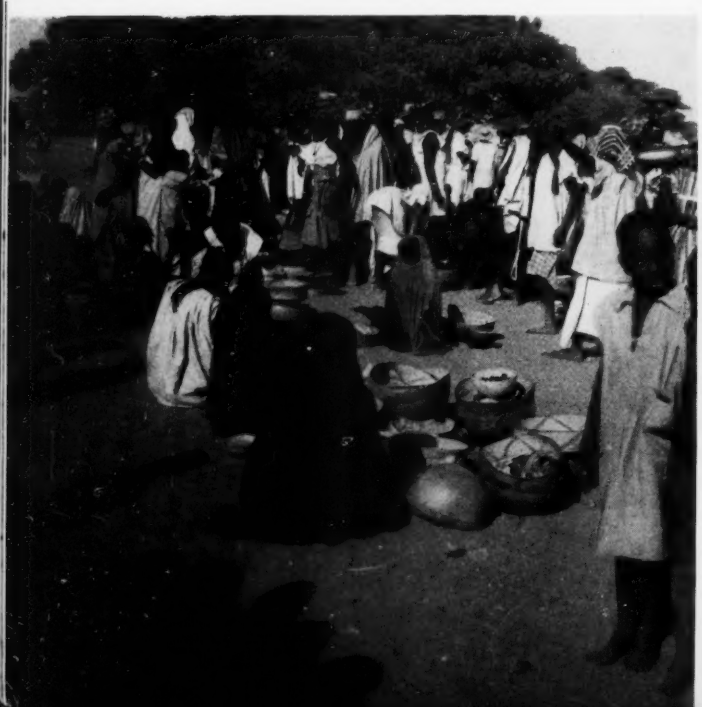
NOVEMBER 22. Bourem. Another overnight stop. Arrived just after sundown. But here is the Niger. Tired as I am, cannot resist temptation to run to the bank and look at the great river. On the way from Tessalit I collected a few insects, and noted an increase in the vertebrate fauna. Gazelles of several forms *(Gazella dama, G. rufifrons, G. dorca)* and small antelopes became more and more frequent. Met one

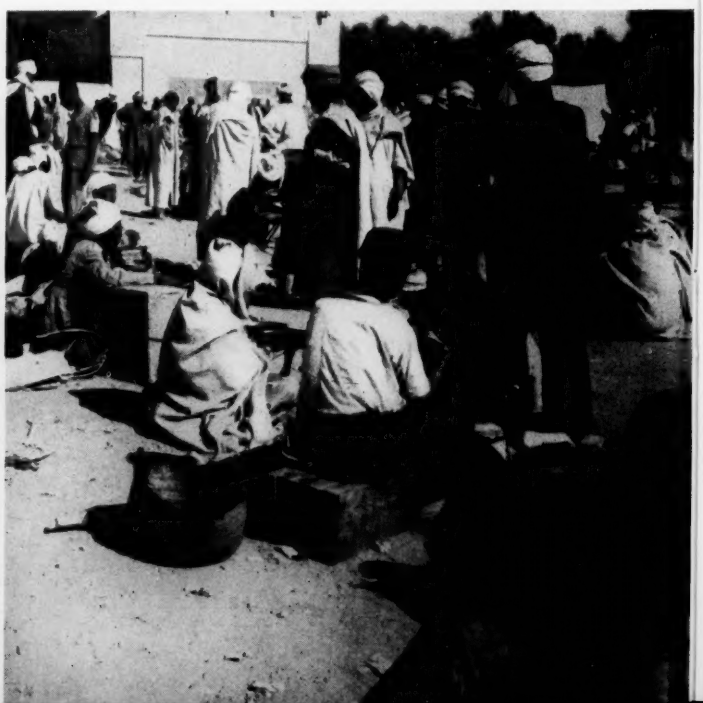
fine herd of ostriches, about 20 birds, not far from the road, but, alas, too far for a camera with no telephoto lens.

Bourem is a small Negro settlement with only two French. After so much empty land in the Sahara this looks like fertile country. There are large herds of longhorned, humpbacked cattle. Our miserable desert rations increase to tolerable proportions.

NOVEMBER 23. Gao. Arrived here this morning after two and a half hour run from Bourem, with a halt on the steppe. There is much life. Numerous bird nests in the mimosa bushes and termitaria. Found a pink colored worm snake *(Typhlops?)* under a cow-dropping. It was not over six inches long, and only under a lens could I distinguish head from tail end.

NOVEMBER 25. Gao. This settlement is in a drier area than that of Bourem. Here the sand dunes come to the Niger's very banks. Mimosas are scrawny and scrubby and there are palmettos. There is Arab in-





The Bariba chief and the first—and favorite—of his nine wives.

fluence showing in Gao, especially in architecture; here the outsides of the mud-brick walls are covered with mud plaster, while deeper within the Sahara they are exposed. Moslems still hold sway, although the people are largely Negroes. From a distance I saw a few Tuaregs, whose headdress and veils have been adopted by the local men.

NOVEMBER 26. Niamey, Niger Colony. It is getting warmer all the time. Now noon hours are what they're supposed to be in Africa, although not unbearable—no doubt because of the dryness. Reached here this morning after ghastly overnight bus trip from Gao. Vegetation has increased to the extent that trees are frequent and the grass, though burnt and yellow, stands to a respectable size. The road led all the way along the Niger. A very populous section. The people in the immediate vicinity of Niamey are Djemma—rather slender and tall.

TO THE SMOOTH RIDING from Colomb-Béchar to Gao, the stretch from Gao to Lagos was a complete contrast. It was plain rough. There was the increasing heat as the Equator came closer by degrees. There were misconnections and rough roads and bickerings among people, including fistfights—in which, thankfully, I was involved only as spectator or ineffectual referee.

In the diary I mentioned the ghastly ride from Gao to Niamey, overnight. I sat in the front of the trans-Sahara truck with eight other sprawling passengers, driver, and mechanic. It was hot and stuffy and my Algerian cold still bothered me. In Niamey I met a Frenchman with whom I made an advantageous deal for a nonstop drive in his truck all the way through Dahomey to Cotonou on the Gulf of Bénin.

Departing at 3 A.M. the morning after my arrival left me little time for Niamey and collecting in its environs. En route to Kandi (where we stopped, after all, for the week end) we lunched in the house of a Negro doctor in Gaya, a small place on the Niger.

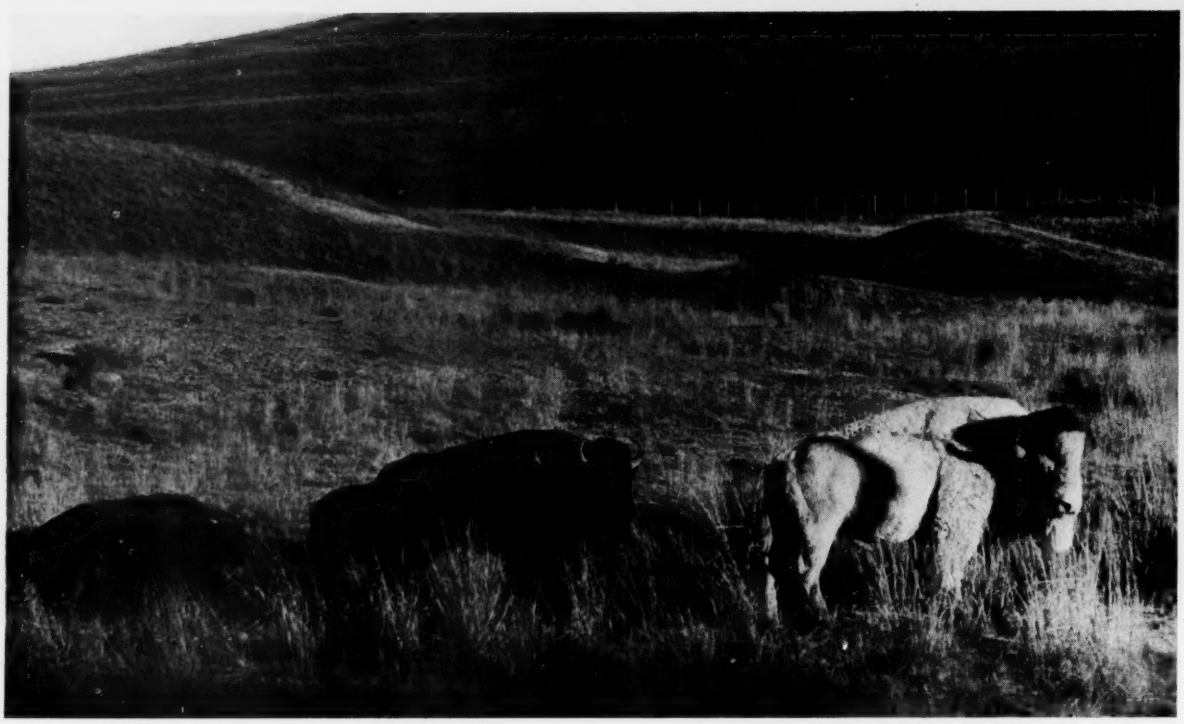
In the doctor's house I admired the furniture made some years ago in Abomey, ancient seat of the Dahomey kings. It represented a high level in the art of sculpture. In the best of aboriginal sculpture from the Pacific area there is a certain crudeness. But these representations of men and animals from Dahomey revealed a high degree of mastery over material and technique, comparable to that of the Egyptians over their granites, basalts, and porphyry. These Dahomey pieces were probably influenced by Western styles, but in the main they followed closely the pattern of the eighteenth century Bénin kingdom which extended through the area of Nigeria and Dahomey (see Melville Herskovits' *Dahomey*).

Kandi is a pleasant village. There I stopped at the Sudan Interior Mission, where I was very kindly received by the missionary, Gus Fredland from Saskatchewan, and his English wife. Gus was on excellent terms with the various local chieftains. We visited in succession the Haussa, the Fulani, and the Bariba chiefs, who allowed me to photograph them. The Fulani chief cut an imposing figure, out of proportion to his influence. He showed very distinct traces of Hamitic blood. Both Fulani and Haussa are Moslem. Their outposts can be found all through West Africa where they are among the principal small traders. But it was the Bariba chief, oldest, and seemingly decrepit, who wielded the most power. I snapped the old gentleman with his *nine* wives, to the oldest, and probably the first, of whom he showed great respect. After talking with Gus I realized how inaccurate are the tribal maps of West Africa I had meticulously copied in London. In his five years in these parts, this missionary has collected a wealth of interesting data valuable to anthropologists.

As for the country, it is all savannah. Two months after the rains it had a brown and burnt look. The grass is burned deliberately in places, but many other fires are probably accidental. The result was poor collecting, except for ants and termites. South of Parakou the land changed from level to low, rolling hills. And after the lovely village of Savé tropical vegetation of the "wet" type prevailed. It was a disappointment to me that little is left of the dense tropical rain forest. Cultivation in continuous plantations—palm oil the chief product near the coast—and dense population have wiped out the great forests.

Cotonou is a grim place of corrugated iron houses, quite unesthetic. I was glad to leave for Porto-Novo the same night, getting a bus for Lagos next morning. This tropical port, seven degrees north of the Equator, will be my GHQ for many weeks of intensive collecting via numerous side trips into Nigeria and the Cameroons. Yours, BORYS

LEFT: *Not a double take! Market scene at far left is in Niamey, Niger Colony. Its counterpart, to right, was photographed in Colomb-Béchar, Algeria, 1,250 miles to the north. Here is the ethnic contrast of the Sahara: the people who live along its southern edge are predominantly Negro; on its northern edge, Arabs are in the majority. Across the "barrier," intermixture is commonplace and age-old.*



Even when American bison were numbered in millions, white individuals were very rare. This bull, called "pied" because of his black crown, belongs to the herd on the National Bison Range at Moiese, Montana. (Photograph by Peyton Moncure)

PEYTON MONCURE

WHITE BISON

IF YOU ARE DRIVING through western Montana, you are likely to visit the National Bison Range at Moiese. There you might see an animal whose like was once hunted and killed because of its great rarity. It is a white bison.

A white bison was always a rare sight, even in the great herds whose millions blackened the plains in frontier days. Frontiersmen in those times knew positively of but two "white buffalo." The very few of these ghostly freaks of their kind known to the Indians became individualized in legend, objects of superstitious awe. Yet supernatural virtue lay not in the living bison, but in his dead white pelt and skull, for which the Indians killed him; "big medicine" these were, and used by the medicine men in their rituals.

The magnificent white bull pictured above was born in 1933 to normally colored parents. A few years ago he was pure white, except for his blue eyes and the shaggy mass of black hair on the crown of his head (because of this patch of black he is properly described as "pied"). With age, he has turned more of a dirty grayish white. For all his fierce looks, he is more wary than bellicose.

In the National Zoölogical Park in Washington, D.C., you may see a true albino bison. This one has absolutely no pigment in its skin and hair, and has been blind since its birth in 1937. It was sired by the pied Montana bull, not himself a true albino, and was born to the pied bull's own normal mother.

In 1928 twenty-three bison were transported to Alaska from the Montana range. Recently a white calf has been seen with the herd that has grown out of this Alaska nucleus. According to George Mushbach, Superintendent of Refuges, this one and the other two are the only white bison known to be living today.

HUIGRÁ'S MEDICO

IRA L. WIGGINS

DIED. *Dr. Herbert Spencer Dickey, 72, veteran South American explorer and ethnologist, who located the source of the Orinoco in Brazil and discovered the Cuiapo-Pihibi tribe in Colombia; of a heart ailment; in Huigra, Ecuador.*

THE ABOVE NOTICE, published under the heading "Milestones" in the November 15, 1948 issue of *Time*, recalled to mind vividly the enjoyable days I spent as the guest of that remarkable old gentleman during my Ecuadorean field work for the Foreign Economic Administration in 1944.

Dr. William C. Steere, in charge of the botanical field crews in Ecuador, sent me to Huigra at Dr. Dickey's request, to scout the area within a radius of fifteen or twenty kilometers of the village and to secure samples of *Cinchona* bark for analysis in the laboratories of the Misión de la Cinchona in Quito. Dr. Dickey had a small plant for extracting quinine from the *Cinchona* bark and wanted to utilize local supplies if such were available.

I got off the wheezy little train in Huigra at 7:30 P.M. on September 7, thirteen and one-half hours after boarding it in Quito, less than 200 miles away. But in that thirteen and one-half hours we had climbed from 9,300 to 11,400 feet, then descended, over one of the most tortuous stretches of railroad I have ever seen, to 4,500 feet, where Huigra hugs a narrow bench between the foot of a steep mountainside and the brawling Río Chanchan.

Dr. Herbert Spencer Dickey met me and took me to his house—because, he said, he had once had to spend the night in Huigra's hotel—and insisted that I make it my headquarters while securing a field crew and supplies for a modest expedition into the nearby mountains in search of unexploited *Cinchona* trees. An unusual number of delays necessitated a stay of three full days as Dr. Dickey's house guest, during which time I drew heavily upon the wealth of information the elderly physician, ethnologist, and explorer possessed about the people and conditions in Ecuador. Interspersed with the information were intriguing tales of his experiences and adventures in tropical South America.

Dr. Dickey went to Colombia as surgeon for the Tolima Mining Company of South America in 1900 right after securing his M.D. degree from the Boston Medical School. Through the years that followed he served in like capacity for different companies in Colombia, Peru, Bolivia, Brazil, and finally for the Guayaquil and Quito railroad in Ecuador. Since 1900 he had spent the major part of his time in South America, and knew intimately many areas penetrated by few other North Americans. He had a stock of stories about places he had been, the Indian peoples he had seen, studied, and lived among; the political intrigues that had developed, had blown into revolutions, or had been decisively and often bloodily squelched; and the uncertainties connected with practicing medicine in the American tropics. Thrown in for full measure were descriptions of archeological sites still unworked, scores of Indian legends, and hair-raising accounts of narrow escapes from injury and death on mountainside, paramo, and in the jungle.

He had excavated priceless archeological material from burial mounds in Ecuador and Colombia, watched the Jívaro women prepare their intoxicating beverage *chicha,* and sampled the nauseating stuff while a guest of the head-shrinking chieftains. He had tried in vain to save the lives of natives bitten by snakes—antivenom was rarely available—then watched others survive wounds he had thought would prove fatal within the hour. He had slashed his way through trackless jungle, squatted in the smoke filled huts of suspicious Indians, waited days on end for a swollen river to subside so it could be crossed, seen his canoes swamped or crushed like egg-shells with the loss of food, equipment, and medicines. All these things he recounted, and many more besides, with gusto and fine dramatic timing. The listener was sometimes uncertain as to where the scientific reporter forgot himself for a space and let the teller of tall tales take over, but it was all intensely entertaining!

Several years before the Ecuadorean Government banned the exportation of archeological items, Dr. Dickey collected and shipped to the Southwest Museum in Los Angeles, California, a beautiful selection of ornaments, figurines, and small ceremonial vessels made of gold. While excavating one of the ancient burial sites for these

trinkets he was threatened by the Indians living in a nearby village. He ignored their demands that he leave, but the local Indians frightened Dr. Dickey's laborers so badly that they took off immediately. That night the stubborn doctor kept his head on his shoulders only because he took the precaution of moving his sleeping bag to a dense stand of tagua palms on the ridge above his camp. He watched the irate Indians destroy his tent and hunt around the vicinity for over an hour before giving up the quest.

"The next morning I walked into their village with a heavy service revolver on each hip. I set pottery shards along the base of one of the mud walls, backed away about eight or ten paces and smashed them with my guns." Dr. Dickey smiled, hesitated a moment, and said, "I never came so near to cussing and praying at the same time in my life, for I didn't dare to miss one of those shards. I didn't dare take too much time to aim at each one. And I was so scared that it was almost impossible to keep my hand from shaking like a leaf in the wind!

"The bluff worked, though, because the natives let me pack up my few remaining personal belongings, my archeological treasures, and get over the ridge to another village where I got a horse and went on back to Guayaquil."

While I was Dr. Dickey's guest he was living in a wooden frame building of modest size – four rooms and bath, to be exact–furnished him by the Guayaquil and Quito Railroad. The cots on which we slept were the folding, metal type (familiar to every GI who has lived in Army barracks) with their feet in cans of kerosene to keep insects of various sorts from crawling into the blankets. If one listened after turning out the light he could hear faint but distinct crunching, scraping noises coming from the wooden partition separating Dr. Dickey's bedroom from the combination dining room-guest bedroom. Termites and other wood-boring insects were constantly at work in the building. Borers tunneled into the rafters and sheathing that formed the ceiling and roof, carried the sawdust to the openings of their burrows and dumped it into the room below. Every morning I brushed the film of powdered wood from the bedspread, washed a similar layer from my face, and combed the sawdust from my hair. But these little creatures disturbed the doctor not one whit. He had lived too long in the tropics to be concerned or surprised when a table that had stood on his back porch for several months collapsed under a bunch of bananas–a shell of paint was all the termites had left.

Dr. Dickey was forthright in his political views, in his opinions about the blundering policies, as he saw them, of some of our government's representatives in Latin America, and, somewhat to my surprise, on the cause of the Irish in their efforts to fight free from English rule and influence. He admired de Valera, despised Mussolini, excoriated Hitler, and was suspicious of Joseph Stalin at a time when most of us were hoping and believing we could count on Russia's coöperation. He read a dozen periodicals and kept abreast of the daily events through his caterwauling radio.

In 1944 he no longer attempted to practice medcine, but all of the *peones* for miles around came to him when they or members of their families were ill. Often they arrived too late for him to help them, but he did what he could with the few medicines he could afford–he received virtually no pay for his services–and held their respect and confidence.

But the tired old doctor took calmly the disheartening aspects of poverty, malnutrition, high incidence of tuberculosis and venereal disease, and the deteriorating economic condition of the country. Otherwise his weakened heart would have given up earlier than it did. He knew the country and its people. He loved the wildness and grandeur of the snowcapped volcanoes, the shadowy paths through the jungle, and the slashing, roaring, almost smothering rain that churned the dust at the end of each dry season. He accepted the people with their faults and their virtues–and they possessed a goodly number of each. Although he did not crusade against practices he considered harmful to the country and its inhabitants, he spoke freely with little concern for sensitive toes. He was irrascible at times, a man of violent dislikes, but of staunch loyalty. He was criticized by some Americans and heartily disliked by others. At times I disagreed with his point of view, but I respected his honesty of opinion, his simplicity, and his understanding of the countries in which he had spent most of his life. Hard this life had been, with few of the rewards most men seek–but how usefully he had spent it, there in remote places where men like him are few, and sorely needed by their fellows.

Such was Huigra's medico. My own recollections, though brief, are of a most genial host, of

FROM THE READER

EDITOR, *Pacific Discovery*
SIR:

Dr. Gayle Pickwell's delightful travelogue from seacoast and foothills to timberline through "The Pines of California" in the November-December (1948) issue of *Pacific Discovery* is in general so well done and so beautifully illustrated that one hesitates to offer any criticism of it. The one phase of the article that seems unfortunate, in view of the progress that has been made in recent years in bringing some semblance of order out of the former chaos in the use of common names applied to trees, is Dr. Pickwell's choice of names for a few of the pines with which he deals. Thus we find "big cone pine" for Coulter pine, "hickory pine" for bristlecone pine, and "silver pine" for western white pine, while "western yellow pine" is indicated as the correct name for *Pinus ponderosa* and ponderosa pine is indicated only as one encouraged by lumbermen.

While not all of us agree in every case with the choice of names made by the American Joint Committee on Horticultural Nomenclature as published in the second edition of "Standardized Plant Names" and adopted in the revised "Check List of the Native and Naturalized Trees of the United States, including Alaska," issued by the U. S. Forest Service, we can certainly agree with the aims of this committee in attempting to secure the recognition of a single common name for each tree species as against the confusing array of names formerly applied to some trees. Moreover, in the case of the native pines of California there seems to be no real justification for failing to use the names chosen by the committee. We hope that in the interests of a better common understanding Dr. Pickwell will adopt them in any future contributions on western trees. WILLIS W. WAGENER

San Francisco, January 4, 1949

PD *took the liberty of amplifying Dr. Pickwell's "yellow pine" to the more specific and long established "western yellow pine," and also introduced the reference to "ponderosa pine" as the name preferred by lumbermen. Use of the latter name is growing rapidly and it may in time be heard more frequently than either of the former. This journal is strongly in favor of eliminating the existing confusion in popular nomenclature.*—EDITOR.

DR. GAYLE PICKWELL
% EDITOR, *Pacific Discovery*
SIR:

I have enjoyed reading and identifying "The Pines of California."

At Inverness, in Marin County, there are stands of pine trees, which from a distance—deceptively, of course—seem to be large palms. The natives around these parts call them "umbrella pines."

You must know these trees, of course. Perhaps you even identify them in this current article and I fail to recognize them.

. . . I would greatly appreciate a line from you about these trees at Inverness.

MARIO CORBETT

San Francisco, January 11, 1949

Dr. Pickwell replies to Mr. Corbett's letter, in part: "I cannot be certain without seeing the trees referred to as to their identity, but from my knowledge of the pines in Marin County I would say they are Bishop pines." Mr. John Thomas Howell, Curator of Botany in the California Academy of Sciences and an authority on the flora of Marin County, says that the Inverness "umbrella pines" are indeed Bishop pines.—EDITOR.

his absorbing conversations, and vivid and vital personality. My mind will keep these things, even when I have forgotten how Dr. Herbert Spencer Dickey was wont to contaminate high grade Scotch with a locally distilled brandy flavored with anise. God rest his soul.

REDWOODS

Send 10 cents each for these attractively illustrated pamphlets: "A Living Link in History," by John C. Merriam . . . "Trees, Shrubs and Flowers of the Redwood Region," by Willis L. Jepson . . . "The Story Told by a Fallen Redwood," by Emanuel Fritz . . . "Redwoods of the Past," by Ralph W. Chaney. All four pamphlets free to new members—send $2 for annual membership (or $10 for contributing membership).

SAVE-THE-REDWOODS LEAGUE
250 Administration Building
University of California, Berkeley 4, California

Experimental Studies on the Nature of Species: III. ENVIRONMENTAL RESPONSES OF CLIMATIC RACES OF *ACHILLEA*. By Jens Clausen, David D. Keck, and William M. Hiesey. Carnegie Institution of Washington (Publication No. 581), Washington, D.C. 1948. iii + 129 pp. Illus. Paper, $2.50. Cloth, $3.50.

This book is the third in a series, by the same authors, dealing with the effects of environment on closely related races and species of plants. In it they discuss the responses of eleven races of two common Yarrows (*Achillea borealis* and *A. lanulosa*) to climatic factors while growing at three experimental gardens and under constantly controlled conditions in the greenhouses at the California Institute of Technology. The gardens are located at Stanford University, elevation 17 meters; Mather, on the western slopes of the Sierra Nevada, elevation 1,400 meters; and near the summit of Tioga Pass, Timberline Station, elevation 3,050 meters.

The plants tested were grown from seed collected along a transect approximately 200 miles long, extending from the coastal bluffs at San Gregorio, California, eastward across the Coast Ranges and the San Joaquin Valley, up the western slopes of the Sierra Nevada, through Tioga Pass, and down the eastern side of the range to Leevining. Other populations were grown from seed or from divided plants obtained as far south as San Luis Obispo County, and northward to Alaska. Some of the populations were studied only at the Stanford garden. Other selected races were tested at all three gardens and were subjected to extreme variations in climatic conditions.

In general, each race responded best in the experimental garden possessing climatic factors most nearly approaching those that obtain in the region from which the seed was collected. Conversely, the greater the divergence of the climate at a particular garden from the climate where the plants grew spontaneously, the less satisfactorily the plants responded. Thus, plants adapted to the mild climate and long growing season of the central California coast, when transplanted to Timberline, never flowered and often died in from one to three seasons. Likewise, those transplanted from Timberline to Stanford appeared to be devitalized by the long period of mild temperatures and either died or were badly dwarfed and set little or no seed.

Plants selected from the more important climatic races were studied under controlled conditions at the California Institute of Technology by the third author. In these experiments, plants were subjected to various combinations of temperatures and to different periods of illumination. Under controlled conditions the plants from low altitudes did well under cool day temperatures and mild night temperatures, but plants from higher altitudes and from high latitudes remained vegetative and produced few or no seeds. Other races needed warm day temperatures of about 26° C., followed by night temperatures of about 7° C., to produce flowers and seed. Those from the highest altitudes required more intense illumination than was available at Pasadena during the early spring to bring them into flower.

The findings reported in this book indicate that each ecological race reaches equilibrium with the environment, but that this equilibrium is dynamic and somewhat flexible, the flexibility permitting each race to respond, at least to some degree, to climatic changes of moderate amplitude. The extensive field work and garden experimentation carried on by these workers have demonstrated the presence of at least eleven recognizable climatic races growing along the transect, and that these races have inhabited most of the environments, outside the deserts, available in the Northern Hemisphere.

Mechanically the book is excellent. Lengthy tables containing statistical data, well constructed graphs, and high quality half-tones help to pack a tremendous amount of information into its 129 pages. A bibliography of selected references and an exhaustive index increase the value of the book. It is a valuable book for anyone interested in the problems of speciation.

IRA L. WIGGINS
Natural History Museum
Stanford University

BETWEEN PACIFIC TIDES. By Edward F. Ricketts and Jack Calvin. Stanford University Press. 1948. Second edition. xvii + 365 pp., 46 pls., 129 figs. $6.00.

For years the old standby of Pacific coast marine biologists has been Johnson and Snook's classic, *Seashore Animals of the Pacific Coast*. But in April 1939 there appeared a new type of marine biology book which immediately became extremely popular. Despite a large printing this first edition was exhausted within three years. This book, Ricketts and Calvin's *Between Pacific Tides*, put into actual practice the ecological and habitat study methods which are so important to the field biologist. The chapter and section titles read like a trip along the seashore—"Protected Outer Coast" – "Rocky Shores" – "Mid-tide Horizon" – "Exposed Rock" – "Under Rock" – "Sandy Beaches" – "Open Coast," etc. The authors' stated intent is to stir curiosity rather than to give temporary answers. This stimulation of interest is greatly aided by some 191 excellent photographs which together with the many line drawings provide the student as well as the professional with a ready habitat reference and guide.

The publication on August 30, 1948 of the revised edition again makes this extremely useful volume available to the student of marine ecology. The new edition has the same text, but added material in-

creases the pagination from 320 to 365 pages. This is partly owing to a 12-page increase in the Annotated Systematic Index and Bibliography required by the addition of some 150 selected titles. The new text material comprises a 33-page section on "Marine Plankton of the Pacific Coast." To cover the complex phases of this subject in such a short space is no simple task, but the authors have given a very commendable account. A Foreword by John Steinbeck and a color frontispiece of chitons complete the list of additions to this revision.

That *Between Pacific Tides* will become a classic of western American marine ecology is unquestioned, but such feeble tribute will never compensate for the loss which biology suffered as the tragic result of an automobile accident in Pacific Grove, California, on May 12, 1948 in which the senior author, Mr. Ricketts, lost his life.

EARL S. HERALD

Steinhart Aquarium
California Academy of Sciences
San Francisco

MOUNTAIN PROSPECT. By Scott Russell. Chatto & Windus, London. 1946. The Macmillan Company, New York. 1948. xvi + 248 pp., 46 photographs, 7 maps. $5.00.

Scott Russell wrote his book in Changi Camp, Singapore, during the three years 1942-45. Writing it was for him escape from "the strange half-living of prisoners of war. For the body there was no escape, for the mind only that which each could make for himself. The present and the future were alike blank, but the past remained in memory and the mind turned to it, to the experiences one had enjoyed most."

The full-living past of Scott Russell began in England but took him early to New Zealand, where the schoolboy saw his first "mountain prospect." On the South Island hills back of Nelson his "interest in the natural countryside" was born—there, he might have said, was born a mountaineer. With his brother and young companions Scott went from hills to bigger hills to mountains—the Southern Alps. He began, as he learned climbing, to discover and get the feel of his inner drives. Others would make the first, or the highest ascent. But in those early 1930's the magic word "unexplored" still crossed certain ranges on the maps of South Island. Scott and his friends took this as personal challenge—"we were breaking new ground which is among the keenest of human delights." In these days, too, he discovered the great literature of mountaineering, the books of Whymper, Young, Tyndall; and he was welcomed into the New Zealand Alpine Club. The mountains had him then, and so did science. "My first essay at the study of alpine vegetation led me to make botany the major subject for my university degree. Work and recreation could, I felt, harmonize—the combination of my interests, botanical and mountaineering, should in the future yield more than either if separately pursued."

After a dozen New Zealand years it was "home" for advanced scientific training—and Scott discovered the British hills, finding them worthy a mountaineer. He spent his week ends on their crags, and his longer leaves in the "old" mountains, the Alps. He was a full-fledged climber now—"but scientific exploration remained a dream, remote and unattainable."

Not for long. From his South Kensington research laboratory he smelled out an expedition in the making and, though preparations dragged out for months, Russell eventually found himself on an ancient, stinking little sealer out of Tromsö, second in command of a party of scientific gentlemen bound for Jan Mayen Island in the Greenland Sea.

For all who didn't know (this reviewer was one) that a great volcanic mountain rises nearly 8,000 feet sheer out of the sea between Norway and Greenland, this part of the book, "A Summer in the Arctic," will open up one more of their own particular "unexplored" parts of the earth. Especially, here is a look into the "why" of such expeditions. Russell was in charge of botanical work. "The real problem of the field botanist is to understand the relationships between plants growing side by side, how they adapt

YOUR GOLDEN OPPORTUNITY

for a fascinating summer experience at the Audubon Nature Camp of California. It will give you wonderful lifelong memories, new ideas, new enthusiasm in making your courses a source of inspiration to your classes. The Camp is located at Donner Pass among the spectacular peaks of the Sierra, with delightful recreational facilities. Each camper enrolls in a two-week session, and participates in interesting, informal field classes under expert naturalist leadership. Courses are designed to equip teachers and other youth leaders to instill appreciation of the value—and need of conservation—of our soil, water, plant and wildlife resources, and the relation of their intelligent treatment and wise use to human welfare. Enrollments for 1949 sessions are filling up now. Write today for illustrated descriptive folder PD-1, to Mrs. Ethel E. Richardson, 887 Indian Rock Ave., Berkeley 7, California.

themselves to the vagaries of soil and climate." There were intriguing problems of the Arctic's scanty vegetation to be studied. "We wished to find out how closely the distribution of the vegetation was controlled by the supply of nitrogen in the soil" in a region where soil has little of that vital element. "Another of the questions we investigated was the manner in which plants adapt themselves to the short arctic summer;" and there was the vast snowy cone of the Beerenberg to climb.

Thus mountaineer became seasoned scientist. "My Arctic summer had clarified my ambitions: I had found a promising field for botanical investigation and the expedition had proved to me that scientific work and mountain travel could be happily combined. My mind was made up. I wished to spend the next few years alternately on expeditions and in the laboratory evaluating my results. . . . Our return to England had been clouded by the Munich crisis but I had yet to realize that the chancelleries of Europe would decree a different destiny for my generation."

Nevertheless, Scott Russell's greatest "mountain prospect" was at hand—fifteen months in the Karakoram with Eric Shipton, great mapper of the Himalayas. In absorbing pages that fly too fast to the book's end, there is much that rings familiarly to one who has read some of the grand literature of Himalayan mountaineering and exploration: the never-dull details of fitting out; the "outward marches"; the ultimate reality of earth's loftiest summits. Many books tell these things; but, as he and his fellows turned of their own will to the downward march from near-fulfillment of their greatest prospect to face war, Scott Russell could reflect (in retrospection) that, wherever he had mountaineered,

> The essence of experience had always been the same. In our bodies we had known the forces which from the dawn of time had controlled the life and happiness of man; hunger and cold; heat and fatigue; storm and the fury of wind; danger and fear; friendship and beauty so pure that we could scarcely believe it real, and contentment which it seemed the earth shared with us. We had gained also some understanding of the configuration of the earth's surface, of the forces which had moulded it, and of the way in which these things controlled man's life and free movement. This is no profound knowledge . . . but it added to the horizon of our minds . . . As a scientist I felt I had gained a particular benefit for I had been led away from those comfortable specialized grooves in which, at other times, it is so easy to confine one's interests. Climatology, geology, the elementary economics of living had obtruded themselves into every investigation. These things had surely made us of better judgment, and saner, than otherwise we might have been, and humbler too, for conceits and ambitions tend to wilt in the shadow of great hills.

Mankind needs the prospect of mountains, and science needs Scott Russells. D. G. K.

THE ARGONAUT

This paper should be in every home as a part of your family.

The editorials are fearless and honest. We are endeavoring to protect your home-life by giving you actual facts regarding civic affairs relating to excessive taxes and other burdens, which are threatening the loss of your property.

You can believe what you read in THE ARGONAUT . . . because everything that is printed has been verified.
Subscribe now to this paper.

544 MARKET STREET, SAN FRANCISCO, CALIFORNIA

Telephone SUtter 1-1700

Books for Naturalists

FOR THE BIRD LOVER

Birds of the Pacific States. By RALPH HOFFMAN. $4.15

A Field Guide to Western Birds. By ROGER TORY PETERSON. $3.65

FOR THE AMATEUR MINERALOGIST

The Art of Gem Cutting. By H. C. DAKE and H. M. PEARL. $1.55

Gem Testing. B. B. W. ANDERSON. $5.15

A Key to Precious Stones. By L. J. SPENCER. $3.35

Quartz Family Minerals. By H. C. DAKE, FRANK L. FLEENER, and BEN HUR WILSON. $2.85

FOR THE HOME AQUARIST

The Modern Aquarium. By WILLIAM T. INNES. $1.05

Goldfish Varieties and Water Gardens. By WILLIAM T. INNES. $5.15

Exotic Aquarium Fishes. By WILLIAM T. INNES. $6.75

FOR THE BEGINNING NATURALIST

New!

The Amateur Naturalist's Handbook. By VINSON BROWN (Contributor to *Pacific Discovery*). Illustrated by Don Greame Kelley (Editor of *Pacific Discovery*). $3.65

". . . A very fine biological handbook . . . gives excellent basic instructions for collection and preservation of specimens and for studying actual living organisms." —*New York Times.*

". . . Deals with nature study in the widest sense, including animals, rocks and weather . . . a veritable encyclopedia in its field, undoubtedly the best thing of its kind in print."—*Book-of-the-Month Club News.*

Above prices include postage and sales tax

Order from CALIFORNIA ACADEMY OF SCIENCES

Golden Gate Park, San Francisco 18, California

"RPM" HELPS MRS. BARLINE AVOID CAR WORRIES

"RPM" delivers again

"I don't know much about cars," says Mrs. Jerome Barline of Spokane, Washington, "but I do know I haven't had to spend one cent for repairs since I started using 'RPM'." There's good reason why RPM Motor Oil does such an outstanding job for Mrs. Barline, as well as many thousands of motorists throughout the West. RPM Motor Oil is specially compounded to stop carbon troubles, cling to engine hot spots, prevent bearing corrosion and protect against internal rust. Next time get "RPM's" extra protection for your car.

100% PURE PARAFFIN BASE

RPM

MOTOR OIL

We'll take better care of your car

STANDARD STATIONS INC.

CHEVRON GAS STATION